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The Pangoniinae of Nearctic America Diptera: Tabanidae*

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ABSTRACT: There are approximately ninety-three species of nearctic Pangoniinae, nearly three fourths of which are CHRYSOPS. The remaining species are distributed through seven genera. Two new genera are described, STONEMYIA, to receive a small group of PANGONIA and BUPLEX of authors, and BEQUAERTOMYIA, to receive a new lepid-like species from the Pacific coast. Two new subgenera, PILIMAS and COMOPS, are described to receive hairy-eyed species of STONEMYIA and APATOLESTES, respectively. The genera SILVIUS, ESENBECKIA, APATOLESTES and BEQUAERTOMYIA are confined to western North America.

The following species and variety are new: *Chrysops beameri*, *C. bishoppi*, *C. clavicornis*, *C. dissimilis*, *C. hungerfordi*, *C. latifrons*, *C. robusta*, *Silvius laticallus*, *S. sayi*, *Apatolestes albipilosus*, *A. ater*, *A. comastes willistoni*, *A. hinci*, *A. similis*, and *Bequaertomyia anthracina*.

With respect to terminology, the term "vertex" is used to replace "frons" as loosely used by systematists.

The key to CHRYSOPS is based principally on the wing picture. The abdominal pattern is next in importance as a character, and in a few species the shape of the antennae is of value. A small group of Chrysops confined to the west and southwest are peculiar in that the antennae are extremely swollen and in the female the vertex is very broad, in the male the eyes are not absolutely contiguous.

A few male Chrysops are reported for the first time. *C. virgulata* Bell, and with doubt the European *C. lapponica* Loew are reported for the first time as nearctic. The following are new cases of synonymy within the genus Chrysops: *C. lupus* Whit. for *C. furcata* Walk., *C. fraternus* Kröb. for *C. wiedemanni* Kröb., *C. canadensis* Kröb. for *C. frigida* O. S., and *C. moerens confusa* Kröb. for *C. callida* O. S. *C. pertinax* Will. and *C. noctifera* O. S. are distinct species and not synonymous as Hine has stated. The type material of Hine's *C. coquilletti* contains two species, my *C. clavicornis* being represented.

Pangonia dives Will. is preoccupied. The correct name for this species is *Stonemyia* (*Pilimas*) *californica* Big. *Silvius jonesi* Cres. is not a Silvius, but probably a Stonemyia, subgenus Pilimas.

The following species are not included because evidence is lacking or insufficient: *Chrysops cincticornis* Walk., *C. sepulchralis* (Feb.), *Pangonia macroglossa* West, *Corizoneura velutina* Big., and *Ricardoa latiflagrum* End.

NO MONOGRAPHIC studies of North American Tabanidae have been attempted since the classical Prodrôme of Osten Sacken (1875-1878). However, Kröber (1926) more or less successfully brought together the North American species of the genus Chrysops; but the unfortunate aspect of this work is that the author lacked sufficient material, and consequently was quite dependent on the literature and the determinations of others for his results. Nevertheless, Kröber's study has contributed materially to the preparation of the present paper. His keys, and especially his observations on the Wiedemann types, have proved useful.

It is the purpose of the author to redescribe all recognizable species of the subfamily Pangoniinae north of Mexico, to attempt to establish more firmly their generic status, and to offer synoptic tables and plates as an aid in identification and separation. Ninety-three species, distributed through eight genera, are included. Fourteen species, one variety, two genera and two subgenera are described as new. In a few instances cases of synonymy have been established.

The literature on the Tabanidae, although not scanty, is for the most part scattered throughout numerous short papers. Hence the need for intensive monographic work is immediately perceived. The literature may be divided into three fields, taxonomic, economic, and biological, although in many instances overlapping must of necessity occur.

Among the outstanding systematic studies in this country are those of Osten Sacken and the many small papers of Hine, and in a more restricted sense, those of Daecke (1905-1907), Malloch (1917), McAttee and Walton (1918), Wehr (1924), Stone (1930), Schwardt and Hall (1930), and Philip (1931). The economic importance of the Tabanidae is too well known to require discussion in this paper. Perhaps the most important contribution in this respect in this country is that of Francis and Mayne (1922) in their work on the transmission of tularaemia by *Chrysops discalis* Will. Also, the investigations of Mitzmain (1913) with respect to the transmission of surra by *Tabanus striatus* Fab., and those of Webb and Wells (1924) must not be overlooked. Not a great deal is known concerning the biology of the Tabanidae; however, various workers have made contributions of a bionomic or strictly biological nature. At present the most complete studies are being made by Dr. H. H. Schwardt at the University of Arkansas. Likewise, Hine (1903 and 1906), Mitzmain (1913), Marchand (1919 and 1920), Webb and Wells (1924), Cameron (1926), Stone (1930), and Philip (1931) have substantially contributed to our knowledge in this field.

To the writer the adults of the Tabanidae are intensely interesting taxonomically, primarily because of their reputed lack of characters. The males, lacking the usual blood-sucking propensities of the females, are poorly represented in collections. It has been suggested to the author several times that he make a study of the abdominal terminalia of the males, but because of lack of material, such an investigation at present would scarcely prove profitable.

Other workers have approached the Tabanidae from this aspect and have failed. Cole (1927) has concluded that the range of variation in the species examined is so slight, that it is doubtful if the characters will in all cases prove of value in taxonomic work.

The author considers the subfamily Pangoniinae, in its broadest sense, to include all species with apical spurs on the hind tibiae, as opposed to the Tabaninae in which these spurs are lacking.

The family Tabanidae of the brachycerous Orthorrhapha may be characterized as follows: Bristles lacking; eyes denuded or pilose, in life green or purple iridescent, usually patterned, as a rule, but not always, holoptic in the male and always dichoptic in the female; flagellum of antennae five to eight or nine segmented; wings with an ambient costal vein and a three-branched radial sector; alulae large; empodia pulvilliform; genitalia never prominent.

With respect to morphological terminology the writer has attempted to follow Bromley (1926); however, conditions have arisen where it was necessary to make modifications. It should be noted that the term "vertex" (Pl. XXXVI, fig. 94) has replaced the "front" or "frons" loosely used by systematists, and that "frons" applies to that sclerite just below the antennae, which in the Tabanidae is fused with the clypeus. The Comstock-Needham system of wing venation has been adopted. With respect to the wing picture in the genus *Chrysops* I follow Osten Sacken and Hine. Any infuscation in the apical region of the wing concolorous with the crossband is considered as the apical spot. It is very difficult to select an appropriate terminology for the abdominal patterns in the genus *Chrysops*. In speaking of triangles, the apices are always toward the anterior margins of the segments, whereas "trapezoidal spots" have their bases directed anteriorly; in "inverted V-shaped spots" the apices are anterior; by "geminate spot" (Pl. XXXVII, figs. 107, 111, 114) is meant a figure composed of two more or less divergent variously shaped angulate spots more or less broadly joined near the anterior margin of a segment, and it follows that a "double geminate spot" (Pl. XXXVII, figs. 105, 106, 114) implies four spots joined together anteriorly, the median two paired and usually the broader, the outer two paired and usually the narrower, the angles of divergence variable. The "usual stripes" on the thoracic dorsum refers to three brown or fuscous stripes separated by gray or yellow pollinose stripes, and on the pleurae a brown or fuscous stripe with gray or yellow pruinosity on each side.

CONCERNING THE LITERATURE EMPLOYED

The specific references include original description, synonymy, any additional description, keys, figures and notes of biologic and economic importance. All other references, such as lists, casual notations, and catalogues are excluded, although many of these have been used consistently throughout the work in order to help verify distributional data.

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KEY TO GENERA

- | | |
|---|-----------------|
| 1. Flagellum of antenna with five distinct annuli..... | 2 |
| Flagellum of antenna with eight distinct annuli..... | 4 |
| 2. Pedicel of antenna about half as long as the scape..... | SILVIUS Meigen. |
| Pedicel of antenna more than half as long as scape, often nearly as long..... | 3 |

3. Wings evenly infuscated; abdomen globose, much wider than thorax; antennae very slender and elongate; stump at bifurcation of vein $R_4 + 5$.

NEOCHRYSOPS Walton.

Wings irregularly infuscated, exhibiting a variety of patterns (entirely hyaline in *C. hyalina* Shannon); abdomen normal; antennae variable; bifurcation of vein $R_4 + 5$ without a stump (rarely appearing adventitiously)....CHRYSOPS Meigen.

4. Vein 2d A of wing sinuous.....BEQUAERTOMYIA g. n.
Vein 2d A of wing not sinuous..... 5
5. Eyes of female acutely angulate above; anterior portion of wings infuscated.

GONIOPS Ald.

- Eyes of female normal; wings of uniform color..... 6
6. Palpi short, stubby, about equal in length to proboscis which is conspicuously shorter than headAPATOLESTES Will.
Palpi slender, distinctly shorter than proboscis which is often as long as or longer than head 7
7. Cell R_5 petiolate.....ESENBECKIA Rond.
Cell R_5 open.....STONEMYIA g. n.

Chrysops Meigen (1803)

1803. *Chrysops* Meigen, Illiger's Mag., II, 267.

1823. *Chrysops* Duméril, Consider. Gener. Classif. Insectes, 227.

1856. *Nemorius* Rondani, Prodrum. Dipt. Ital., I, 171.

1873. *Haemophila* Kriechbaumer, Verh. Zool. Bot. Ges. Wien., XXIII, 70.

1882. *Haematophila* Verrall, in Scudder, Nom. Zool., I, 152.

1920. *Heterochrysops* Kröber, Zool. Jahrb., Abt. Syst., XLIII, 1-4, pp. 50 and 55.

1922. *Neochrysops* Szilady, Ann. Mus. Nat. Hungarici, XIX, 126 (nec. Walton).

1923. *Ziemannia* Enderlein, Deutsche Ent. Ztsch., p. 544.

1923. *Kleineana* Enderlein, Deutsch. Ent. Ztsch., p. 544.

1926. *Psylochrysops* Szilady, Zool. Anz., LXVI, 328.

1926. *Turanochrysops* Stackelberg, Bull. Ent. Res., XVI, 4, p. 326.

Genotype. *Tabanus caecutiens* Linnaeus, 1758.

Generic Characters. Eyes denuded, in life green iridescent with a purple pattern, separated in the female, contiguous in the male; ocelli present; the female with a frontal callus; frontoclypeus prominent; antennae slender or swollen, the flagellum five-segmented, sometimes the long basal segment appears more or less annulated, pedicel more than half as long as the scape; proboscis about equal to the length of the head or shorter; palpi more or less lanceolate, about three fourths the length of the proboscis. Wings usually with an infuscated picture. Flies relatively small, rarely exceeding twelve millimeters. Perhaps more variation is exhibited in the dorsal abdominal patterns than in any other group of the Tabanidae.

Specific Characters. The key is based primarily upon the wing picture. At present this affords the most satisfactory character that may be applied to the whole group within our fauna. Next in importance is the dorsal abdominal pattern, although this character must always be used in connection with others. A most valuable character in some forms is to be found in the shape of the antennae and width of the vertex, but unfortunately this has proved appli-

cable to less than a dozen species. It may be well to point out here that there are in North America two very distinct groups as based upon structural characters. One group, principally western and southwestern in distribution, numbering but eight species, has distinctly incrassate antennae and in the female the vertex is at least as broad as long, usually broader; it appears that in studying the males of this group, the eyes are not absolutely contiguous, in the strict sense of the word, but are separated by a very narrow space; however, this is true in the case of some males of the other group. In the other group the antennae for the most part are relatively slender (exception, *C. brunnea* Hine) and in the female the vertex is longer than broad, and the eyes of the male are typically contiguous. In this latter group are included the majority of our species. Another character of importance is the frontoclypeus and its color.

Because of the frequent sexual dimorphism exhibited by this genus and because, unfortunately, all of the males are not yet known, it is necessary to construct a key for each sex. The typical wing picture of every female has been figured, consequently this character is not dwelled upon at any length in the descriptions.

KEY TO FEMALES

1. Wings hyaline *hyalina* Shan., p. 308
Wings pictured 2
2. Apex of wing beyond crossband hyaline, sometimes just a trace of a cloud..... 3
Apex of wing beyond crossband infuscated..... 12
3. Whole wing infuscated to distal margin of crossband, more dilute in anal area *divisa* Walker, p. 289
Whole wing not infuscated to distal margin of crossband..... 4
4. Cell 2d M hyaline..... 5
Cell 2d M infuscated, as a rule for at least half its area, often more..... 7
5. Abdominal pattern a contrast of yellow and fuscous; cell R hyaline; crossband of wing very faint..... *fulvistigma* Hine, p. 300
Abdomen black or fuscous; cell R partially or wholly infuscated..... 6
6. Crossband of wing saturate black; abdomen black..... *nigra* Macq., p. 318
Crossband of wing faint, light brown; abdomen fuscous..... *nigribimbo* Whit., p. 319
7. (4) Pile of pleurae yellow or orange..... 8
Pile of pleurae, and usually of cheeks and dorsum of thorax whitish to gray..... 10
8. Abdomen typically black, although rather indistinct grayish middorsal triangles may sometimes be seen; pleurae densely golden-yellow pilose..... *celer* O. S., p. 275
Abdomen black, the sides of the anterodorsal region encroached upon by yellow, of variable extent; pile of pleurae pale yellow..... 9
9. Posterior margins of abdominal segments conspicuously gray; grayish-yellow lateral spots confined to small area..... *sordida* O. S., p. 340
Posterior margins of abdominal segments not gray; yellow lateral spots of greater extent; yellow or grayish-yellow middorsal triangles frequently present.
excitans Walker, p. 290
10. (7) Wing picture dilute, especially the crossband; cell 1st A hyaline; the black of the abdomen invaded dorsolaterally on segments I and II by a yellowish-gray spot *oculux* Whit., p. 281
Wing picture saturate; cell 1st A partially infuscated at apex; the black of the abdomen not encroached upon by lateral spots..... 11

11. Base of cell Cu_1 hyaline.....*carbonaria* Walker, p. 274
Base of cell Cu_1 infuscated; large obscure gray middorsal triangles more likely to be present; generally larger species.....*mitis* O. S., p. 314
12. (2) Apical spot of the wing usually rather narrow, at the most including only the extreme apex of cell R_4 13
Apical spot of the wing generally broad, of greater extent, including as a rule at least half of cell R_4 and often attaining cell M_1 27
13. A tooth-like projection from the distal margin of the crossband extending into cell R_3 almost attaining the bifurcation of vein $R_4 + 5$*nigripes* Zetter., p. 320
Distal margin of crossband relatively regular..... 14
14. Scape of antenna distinctly more swollen than pedicel.....*dissimilis* n. sp., p. 288
Scape of antenna not swollen more than pedicel..... 15
15. Cell R completely infuscated, cells 2d M and Cu_1 hyaline..... 16
Cell R hyaline, or but partly infuscated; if the former, then cell 2d M is hyaline; if the latter, then cell 2d M is partly infuscated; cell Cu_1 usually shows some infuscation 18
16. Small grayish black eastern species.....*brimleyi* Hine, p. 268
Species with abdomen distinctly patterned in yellow and black; western species.. 17
17. FrontotYPEUS with a very narrow denuded yellow longitudinal stripe...*surda* O. S., p. 342
FrontotYPEUS with a broad denuded yellow longitudinal stripe...*proclivis* O. S., p. 330
18. (15) Abdomen wholly black.....*pertinax* Will., p. 327
Abdomen not wholly black..... 19
19. Apex of hyaline triangle usually exceeds vein $R_2 + 3$; cell R infuscated for about half its area..... 20
Apex of hyaline triangle rarely exceeds vein $R_2 + 3$; greatest portion of cell R hyaline 22
20. Abdomen predominantly black, on each side of the anterodorsal region a yellow spot*noctifera* O. S., p. 321
Abdomen yellow in ground color with a black pattern..... 21
21. Wing picture dilute; oral margins of genae yellow; front and hind femora yellow*bishoppi* n. sp., p. 266
Wing picture saturate; oral margins of genae black; front and most of hind femora black*furcata* Walker, p. 301
22. (19) Frontal callus usually yellow; apical spot of the wing at its base extending into cell R_3 23
Frontal callus black; apical spot narrow, at its base not extending into cell R_3 ... 25
23. Length, 8 mm. to 10 mm.; the black figure of the second abdominal segment practically joins with that of the first.....*sackeni* Hine, p. 335
Length rarely exceeds 8 mm., the black figure of the second abdominal segment does not join with that of the first..... 24
24. Pale species; hind femora yellow; crossband dilute; black abdominal figures faint; no black spot beneath the scutellum.....*cursim* Whit., p. 282
Darker species; hind femora fuscous, at least basal portions; crossband saturate; black abdominal figures more conspicuous; usually a black spot beneath the scutellum*pudica* O. S., p. 332
25. (22) Crossband dilute, not attaining posterior margin of wing...*delicatula* O. S., p. 283
Crossband saturate, usually attaining posterior margin of wing..... 26
26. A black triangle encroaches upon the yellow or gray on each side of the central spot on the second abdominal segment; vertex little convergent posteriorly; apex of cell M_3 often hyaline.....*aestuanus* Wulp, p. 261
As a rule no black triangle encroaches upon the yellow on each side of the central spot on the second abdominal segment; vertex more convergent posteriorly; cell M_3 usually entirely infuscated.....*callida* O. S., p. 271
27. (12) Cell R completely infuscated, rarely a small subhyaline spot near its apex; antennae slender, never swollen..... 28
Cell R not completely infuscated, usually not more than half, sometimes almost entirely hyaline; antennae variable, slender to extremely robust..... 47
28. Hyaline triangle represented by a hyaline spot occupying mostly the center of cell R_3*bistellata* Daecke, p. 267
Hyaline triangle otherwise represented, always open to the posterior margin of the wing 29

29. Crossband broken by dilute areas along the margins of the veins...*shermani* Hine, p. 338
Crossband evenly saturate throughout..... 30
30. Apex of hyaline triangle not extending beyond vein M_1*moeccha* O. S., p. 315
Apex of hyaline triangle extending beyond M_1 31
31. Wholly black species; legs black.....*separata* Hine, p. 336
Not wholly black species; legs variable, usually showing some yellow or brown... 32
32. Abdomen with no conspicuous pattern; usually fuscous or black (indistinct yellow stripes sometimes visible)..... 33
Abdomen conspicuously patterned in yellow and black..... 37
33. Front coxae brown to black; wing picture fuliginous, a rather prominent spot at the bifurcation of vein $R_4 + 5$, sometimes formed by a continuation of the distal margin of the crossband.....*fuliginosa* Wied., p. 297
Front coxae yellow; wing picture brown to dark brown; no spot at bifurcation of vein $R_4 + 5$ *34
34. Hyaline triangle of the wing quite narrow, crescent shaped, open usually to vein $R_2 + 3$; cubital and anal areas frequently dilutely infuscated..... 35
Hyaline triangle of the wing more broadly open at its base, the apex not usually attaining vein $R_2 + 3$; cubital and anal areas hyaline..... 36
35. Dorsum of abdomen with three more or less obsolete yellow stripes; pleurae and thoracic stripes yellow pollinose.....*obsoleta* Wied., p. 322
Dorsum of abdomen entirely fuscous, sometimes a trace of a pale middorsal stripe; pleural and thoracic stripes gray pollinose.....*ultima* Whit., p. 343
36. Hind femora and tibiae predominantly fuscous; dorsum of abdomen entirely fuscous; length 5.5 mm. to 7 mm.....*parvula* Daecke, p. 326
Hind femora and tibiae predominantly yellow; dorsum of abdomen fuscous, frequently with a faint gray middorsal stripe; length 6.5 mm. to 8.5 mm.
lugens Wied., p. 313
37. (32) Abdomen with a broad black middorsal stripe.....*dorsovittata* Hine, p. 290
Abdomen with no black middorsal stripe..... 38
38. The yellow of the abdomen with four more or less complete brown or black longitudinal stripes 39
The yellow of the abdomen not with four longitudinal stripes..... 45
39. Apex of hyaline triangle extending considerably beyond vein $R_4 + 5$, usually attaining at least vein $R_2 + 3$, often vein R_1 40
Apex of hyaline triangle extending but very little beyond vein $R_4 + 5$ 43
40. Lateral abdominal stripes incomplete, not appearing on segments I and II.
pikoi Whit., p. 328
Lateral abdominal stripes complete..... 41
41. Frontal callus black.....*sequax* Will., p. 337
Frontal callus yellow..... 42
42. Apical spot extending but little into cell R_5 ; hyaline triangle broad at base.
beameri n. sp., p. 265
Apical spot typically extending deep into cell R_5 , often into M_1 ; hyaline triangle narrow at base.....*hinei* Daecke, p. 305
43. (39) Ground color of dorsum of thorax plumbeus; at least disc of scutellum brown or plumbeus; frontal callus variable, black to yellow.....*striata* O. S., p. 341
Ground color of dorsum of thorax yellow; scutellum yellow; frontal callus always yellow 44
44. Abdominal stripes obsolete, brown, the lateral stripes scarcely at all represented on segments I and II; apical spot of the wing extending into cell R_5 .
vittata Wied, var. *floridana* John., p. 348
Abdominal stripes conspicuous, black; apical spot of the wing broken or ceasing entirely before entering cell R_5*vittata* Wied., p. 347
45. (38) Fourth abdominal segment with a fuscous cruciform spot.....*ornata* Kröber, p. 324
Fourth abdominal segment not with a fuscous cruciform spot..... 46
46. Apical spot exceeds vein R_5 ; abdomen with a broad yellow middorsal stripe between two black ones.....*univittata* Macq., p. 344
Apical spot not exceeding vein R_5 ; abdomen not so marked.....*inda* O. S., p. 309
47. (27) Antennae distinctly swollen, at least the scape..... 48
Antennae not distinctly swollen, often quite slender..... 58

* The characters used for separating the species of this group are to be applied with considerable caution.

48. Vertex broader than long, or at least as broad as long..... 49
 Vertex longer than broad..... 57
49. First segment of flagellum distinctly longer than the sum of the four apical segments*virgulata* Bell., p. 345
 First segment of flagellum not longer than the sum of the four apical segments... 50
50. Apical spot of the wing not exceeding vein R_5 , as a rule occupying about half of cell R_4 51
 Apical spot of the wing exceeds vein R_5 56
51. Discal cell typically hyaline; a tooth-like projection extends from the distal margin of the crossband into cell R_3 attaining the bifurcation of vein $R_4 + 5$.
latifrons n. sp., p. 312
 Discal cell usually infuscated; no tooth-like projection, etc..... 52
52. Frontoclypeus and oral margins of genae with black spots; antennae moderately incrassate*facialis* Towns., p. 292
 Frontoclypeus and oral margins of genae pure yellow; antennae strongly incrassate, 53
53. Second abdominal tergite with a double geminate black spot.....*robusta* n. sp., p. 333
 Second abdominal tergite not with a double geminate black spot..... 54
54. Scape of antenna much more swollen than pedicel (Pl. XXXV, fig. 84); robust species*coquilletti* Hine, p. 279
 Scape of antenna not much more swollen than pedicel (Pl. XXXV, fig. 91); smaller species 55
55. Abdominal tergites caudad from III with black lateral spots...*hungerfordi* n. sp., p. 306
 Abdominal tergites caudad from III without black lateral spots...*pachycera* Will., p. 324
56. (50) Cell 1st M_2 with a dilute fenestrate spot; scape of antenna not bottle-shaped*fulcastra* O. S., p. 298
 Cell 1st M_2 infuscated to the same degree as the rest of the crossband; scape of antenna bottle-shaped*clavicornis* n. sp., p. 277
57. (48) Abdomen light brown, pattern obscure; scape and pedicel of antenna prominently swollen; apical spot of wing fades out to hind margin...*brunnea* Hine, p. 270
 Abdomen more yellowish, pattern distinct; scape and pedicel of antenna not so markedly swollen; apical spot of wing ceases abruptly in cell R_4 .
flavida Wied., p. 293
58. (47) Discal cell hyaline, a conspicuous infuscated spot at bifurcation of vein $R_4 + 5$ *discaelis* Will., p. 286
 Discal cell infuscated, no spot at bifurcation of vein $R_4 + 5$ 59
59. Black species; pleurae densely fulvous pilose.....*amazon* Daecke, p. 263
 Not black species; pile of pleurae variable; abdomen patterned in yellow and black 60
60. Abdomen typically fuscous or black with a conspicuous yellow middorsal stripe, sometimes on each side of which appears an obsolete stripe of the same color.
wiedemanni Kröber, p. 348
 Abdomen not so patterned, the yellow ground color usually very conspicuous, but not always predominant..... 61
61. Apex of hyaline triangle distinctly exceeds vein $R_2 + 3$, often attaining vein R_1 . 62
 Apex of hyaline triangle not exceeding vein $R_2 + 3$, often not even attaining this vein 65
62. Frontal callus yellow, at least on the disc.....*coloradensis* Bigot, p. 278
 Frontal callus black..... 63
63. Second abdominal segment pure yellow...*geminata* Wied. var. *impuncta* Kröber, p. 304
 Second abdominal segment with two median divergent black spots..... 64
64. Crossband reaches the posterior margin of the wing; apical spot occupies nearly the whole of cell R_4 ; geminate spots on second abdominal segment do not usually attain posterior margin.....*geminata* Wied., p. 303
 Crossband not typically reaching posterior margin of the wing; apical spot occupies about a half of cell R_4 ; geminate spots on second abdominal segment usually attain the posterior margin.....*lateralis* Wied., p. 310
65. (61) Frontoclypeus black, only the pollinosed areas yellow.....*frigida* O. S., p. 295
 Frontoclypeus yellow, denuded..... 66
66. Hind femora entirely yellow; frontal callus always yellow; spot beneath scutellum absent or obsolete..... 67
 Hind femora not entirely yellow; frontal callus variable, often black; conspicuous black spot beneath the scutellum..... 68

67. Ground color of thoracic dorsum and scutellum typically yellow; crossband of wing saturate *flavida* Wied., p. 293
 Ground color of thoracic dorsum and scutellum not yellow; crossband of wing dilute *cursor* Whit., p. 282
68. Second abdominal tergite with a small black spot on each side of the median figure, tergites III and IV each with four black spots *montana* O. S., p. 316
 Second abdominal tergite not with a small black spot on each side of the median figure, tergites III and IV predominantly black with narrow yellow hind margins which expand into middorsal triangles 69
69. Hind femora and tibiae predominantly black; frontal callus usually black; the black median figure on the second abdominal tergite usually attains the anterior margin *dimmocki* Hine, p. 284
 Hind femora and tibiae predominantly yellow; frontal callus usually yellow; the black median figure on the second abdominal tergite does not attain the anterior margin *pudica* O. S., p. 332

KEY TO MALES

1. Apex of the wing beyond the crossband hyaline (apical spot absent) 2
 Apex of the wing beyond the crossband more or less infuscated (apical spot present) 9
2. Dorsum of abdomen at base encroached upon laterally by gray *cuculuz* Whit., p. 281
 Dorsum of abdomen otherwise 3
3. Crossband of wing light brown, very dilute, almost obsolete 4
 Crossband of wing fuscous, saturate 5
4. Dorsum of abdomen a contrast of yellow and fuscous *fulvistigma* Hine, p. 300
 Dorsum of abdomen wholly fuscous *nigribimbo* Whit., p. 319
5. Frontoclypeus yellow except for a fuscous spot on each side *nigra* Macq., p. 318
 Frontoclypeus black 6
6. Base of cell Cu_1 typically with a hyaline spot *carbonaria* Walker, p. 274
 Base of cell Cu_1 infuscated 7
7. Dorsum of abdomen with some yellowish pubescence, especially near the apex and forming median triangles *excitans* Walker, p. 290
 Dorsum of abdomen black pubescent 8
8. Crossband attaining posterior margin of wing; antennae wholly black *celer* O. S., p. 275
 Crossband not attaining posterior margin of wing; antennae not wholly black *mitis* O. S., p. 314
9. (1) Apical spot approximately the same width for its entire length, including only the apex of cell R_4 10
 Apical spot not as above, variable, usually including at least half of cell R_4 , often extending considerably beyond 18
10. Scape of antenna distinctly more swollen than pedicel *dissimilis* n. sp., p. 288
 Scape of antenna not more swollen than pedicel 11
11. A tooth-like projection from the distal margin of the crossband extending into cell R_3 practically attaining the bifurcation of vein $R_4 + 5$ *nigripes* Zetter., p. 320
 No tooth-like projection from the distal margin of the crossband, etc. 12
12. Wholly black species; frontoclypeus black; apical spot practically separated from the crossband *pertinax* Will., p. 327
 Not wholly black species; frontoclypeus yellow; apical spot distinctly united with the crossband 13
13. Apical spot at its base distinctly exceeding vein $R_2 + 3$ *sackeni* Hine, p. 335
 Apical spot at its base not exceeding vein $R_2 + 3$ 14
14. Frontoclypeus and oral margins of g-nae entirely yellow 15
 Frontoclypeus and oral margins of g-nae not entirely yellow, usually with a black spot on each side 17
15. Wing picture dilute *bishoppi* n. sp., p. 266
 Wing picture saturate 16
16. Antennae black, the yellow of the second abdominal tergite encroached upon posterolaterally by a black triangle *acstuns* Wulp, p. 261
 Antennae mostly yellow; as a rule no posterolateral black triangle encroaches upon the yellow of the second abdominal tergite *callida* O. S., p. 271

17. Frontoclypeus black with a narrow yellow midstreak.....*surda* O. S., p. 342
Frontoclypeus yellow with a black spot on each side.....*proclivis* O. S., p. 330
18. (9) Antennae incrassate 19
Antennae not incrassate..... 28
19. Eyes contiguous; light brown species.....*brunnea* Hine, p. 270
Eyes separated, often very narrowly, but nevertheless, distinctly; species not light brown 20
20. Annulate portion of flagellum much shorter than basal segment.....*virgulata* Bell., p. 345
Annulate portion of flagellum not shorter than basal segment, usually longer..... 21
21. Apical spot of the wing extending beyond vein R_5 22
Apical spot of the wing not extending beyond vein R_5 , usually not even attaining this vein 23
22. Antennae yellowish, the scape distinctly bottle-shaped; second abdominal tergite yellow with a median broad black geminate figure and a black spot on each side *clavicornis* n. sp., p. 277
Antennae black, the scape not bottle-shaped; second abdominal tergite not patterned as above.....*fulvastra* O. S., p. 298
23. A tooth-like projection from the distal margin of the crossband extending into cell R_3 to the bifurcation of vein $R_4 + 5$*latifrons* n. sp., p. 312
No tooth-like projection from the distal margin of the crossband..... 24
24. Second abdominal tergite with a double black geminate figure.....*robusta* n. sp., p. 333
Second abdominal tergite not with a double black geminate figure..... 25
25. Frontoclypeus yellow with a row of four black spots across the disc.....*facialis* Towns., p. 292
Frontoclypeus wholly yellow..... 26
26. Second abdominal tergite with black lateral spots.....*hungerfordi* n. sp., p. 306
Second abdominal tergite without black lateral spots..... 27
27. Cell 2d M infuscated subequally with R; crossband sometimes fenestrate; abdominal tergites III and IV rarely with a black spot on each side.....*pachycera* Will., p. 324
Cell 2d M infuscated about one half that of R; crossband never fenestrate; abdominal tergites III and IV always with a black spot on each side.....*coquilletti* Hine, p. 279
28. (18) Discal cell (1st M_2) hyaline.....*discais* Will., p. 286
Discal cell infuscated..... 29
29. Apical spot includes practically all of cell R_4 , often extending beyond vein R_5 ... 30
Apical spot not including all of cell R_4 , never attaining vein R_5 39
30. Apex of hyaline triangle not extending beyond vein M_1*moccha* O. S., p. 315
Apex of hyaline triangle extending beyond vein M_1 often as far as the costal margin 31
31. Apex of hyaline triangle distinctly extending beyond vein $R_4 + 5$, usually attaining vein $R_2 + 3$, and sometimes exceeding it..... 37
Apex of hyaline triangle not extending beyond vein $R_4 + 5$, but sometimes a small hyaline spot at its bifurcation..... 36
32. Conspicuous yellow and black species..... 33
Not conspicuous yellow and black species..... 36
33. Dorsum of abdomen vittate (four black stripes); apex of hyaline triangle not exceeding vein $R_2 + 3$ 34
Dorsum of abdomen not vittate; apex of hyaline triangle attains vein R_1 35
34. Lateral abdominal stripes incomplete; cells 2d M and Cu_1 mostly hyaline; hyaline triangle broadly open.....*pikoi* Whit., p. 328
Lateral abdominal stripes complete; cells 2d M and Cu_1 considerably infuscated; hyaline triangle narrow.....*sequax* Will., p. 337
35. Second abdominal tergite yellow with two median divergent black spots.....*geminata* Wied., p. 303
Second abdominal tergite completely yellow.....*geminata impuncta* Kröber, p. 304
36. Dorsum of abdomen wholly fuscous.....*lugens* Wied., p. 313
Dorsum of abdomen fuscous with three indistinct yellow stripes.....*obsoleta* Wied., p. 322
37. (31) Dorsum of abdomen predominantly fuscous with a trace of yellow on the sides and a conspicuous yellow median stripe.....*univittata* Macq., p. 344
Dorsum of abdomen predominantly yellow with four more or less complete black stripes 38

38. Ground color of thoracic dorsum and scutellum yellow.....*vittata* Wied., p. 347
Ground color of thoracic dorsum and scutellum plumbeus.....*striata* O. S., p. 341
39. (29) Body entirely fuscous or black (including antennae, palpi and greater portions of the legs)..... 40
Body not entirely fuscous or black..... 42
40. Apical spot narrowly joined to the crossband; an infuscated spot at the bifurcation of vein $R_4 + 5$*fuliginosa* Wied., p. 297
Apical spot separated from the crossband; no infuscated spot at the bifurcation of vein $R_4 + 5$ 41
41. Wing practically entirely infuscated to the distal margin of the crossband; a small hyaline spot at the apices of cells R and 2d M.....*separata* Hine, p. 336
Wing not entirely infuscated to the distal margin of the crossband; the hyaline areas of cells R and 2d M appear as a single band near their apices extending from vein $R_2 + 3$ to Cu_1*amazon* Daccke, p. 263
42. (39) Frontoclypeus and oral margins of genae entirely yellow..... 43
Frontoclypeus and oral margins of genae with a large black spot on each side... 49
43. Cells R and 2d M predominantly hyaline; dorsum of abdomen pale yellow with light brown or fuscous markings; second tergite with an inverted V-shaped median spot not reaching the anterior margin..... 44
Cells R and 2d M predominantly infuscated; dorsum of abdomen not as above, often predominantly black 46
44. Ground color of thoracic dorsum and scutellum typically yellow; abdominal figures usually light brown.....*flavida* Wied., p. 293
Ground color of thoracic dorsum and scutellum green gray; abdominal figures usually black 45
45. Basal portion of hind femora black.....*pudica* O. S., p. 332
Hind femora mostly yellow.....*cursim* Whit., p. 282
46. Dorsal abdominal pattern more or less vittate; the second tergite with a narrow black spot on each side of the black median geminate figure.....*montana* O. S., p. 316
Dorsal abdominal pattern not vittate; no black spot on the sides of the second tergite 47
47. The apical spot at its base not reaching the bifurcation of vein $R_4 + 5$; hind femora black*dimmocki* Hine, p. 284
The apical spot at its base practically attains the bifurcation of vein $R_4 + 5$; apical portion of hind femora yellow..... 48
48. Sides of abdominal tergites II to IV broadly incised with yellow.....*pilumna* Kröber, p. 329
Sides of abdominal tergites II to IV very narrowly incised with yellow.....*inda* O. S., p. 309
49. (42) Apex of hyaline triangle not attaining vein $R_2 + 3$*frigida* O. S., p. 295
Apex of hyaline triangle distinctly exceeds vein $R_2 + 3$ 50
50. Abdominal pattern vittate..... 51
Abdominal pattern not vittate.....*coloradensis* Bigot, p. 278
51. Dorsum of abdomen fuscous with a conspicuous yellow median stripe.....*wiedemanni* Kröber, p. 348
Dorsum of abdomen not as above..... 52
52. Dorsum of abdomen yellow with a broad black median stripe.....*dorsovittata* Hine, p. 290
Dorsum of abdomen yellow with a series of black vittate spots (two on the second tergite, four on tergites III and IV, etc.).....*lateralis* Wied., p. 310

Chrysops aestuans Van der Wulp (1867)

(Plate XXXI, fig. 35)

1867. *C. aestuans* Van der Wulp, Tijdsch. v. Ent., X, 135; pl. III, f. 8, 9.
1875. *C. aestuans* Osten Sacken, Prodrôme, I, 378.
1895. *C. aestuans* Hart, Bull. Ill. State Lab. N. H., IV, 227.
1897. *C. aestuans* Lugger, 2d Rept. Ent. Minn., p. 169, fig.
1901. *C. aestuans* Hine, Ohio Nat., II, 168.
1931. *C. aestuans* Philip, Minn. Tech. Bull. LXXX, p. 82.

The following also refer to this species:

1848. *C. moerens* Walker, List, I, 201 (preoc.).
1903. *C. moerens* Hine, Ohio State Acad. Sci. Spec. Pap. No. 5, p. 40.

1906. *C. moerens* Hine, Tech. Ser., Bur. Ent. Bull. 12, pt. II, 36-38.
1920. *C. moerens* Marchand, Mon. Rock. Inst., No. 13, p. 50.
1924. *C. moerens* Wehr, Neb. Univ. Studies XXII, 112.
1926. *C. moerens* Cameron, Bull. Ent. Res., XVII, 23.
1926. *C. moerens* Kröber, Stett. Ent. Ztg., LXXXVII, 280.

Color. Predominantly black with grayish or yellow markings on the abdomen.

Size. Length, 7 mm. to 10 mm.

Structural and Color Characters. Female: A most variable species. Vertex and sides of genae gray to yellowish pollinose. Frontal callus black; frontoclypeus, genae, and palpi orange-yellow. Antennae variable, the ground color orange-yellow; scape and pedicel with black pubescence; flagellum black apically. Thoracic dorsum and scutellum gray to yellow-gray pollinose, the former with rather broad stripes; pleural and sternal regions pollinose with some black showing through. Dorsum of abdomen with a broad, black spot beneath the scutellum practically reaching a heavy geminate black figure on the second segment which, usually, following along the posterior margin on each side, expands again as a black triangle on the yellow or grayish ground color of the segment; remaining segments black, the yellow or gray posterior margins expanding into middorsal triangles. Venter of abdomen variable; frequently dark at the base, usually a broad black median stripe, broken at the margin of the segments; apical segments and a narrow lateral streak, black; elsewhere yellowish or gray. Wings as figured; as a rule cell M_3 is hyaline at the apex and the apical spot at its base often does not attain vein R_{2+3} , however, both of these characters vary. Legs variable; in those forms in which a gray color prevails rather than yellow and the venter of the abdomen exhibits more dark figuration than pale, the front coxae and the greater portions of all the legs are black; where yellow has dominance over the gray, and occupies considerable space on the venter of the abdomen, the front coxae and legs are predominantly yellow. In the first case, yellow appears at the base of the tibiae and middle and hind tarsi; in the second case black appears at the joints, the apex of the front femora, tibiae, and entire tarsi, and the extreme apical portions of the median and posterior tibiae and tarsi. But, as indicated before, for such a variable species these characters will have to be applied with caution. Male: Considerably darker than the female. In some specimens the antennae and palpi are practically black. Thorax and abdomen like the female except for the greater dominance of black, confining the yellow or gray to smaller areas. Cells R and 2d M of the wings

infuscated except for a small hyaline area near their apices. Legs mostly black, except the usual lighter regions. The male exhibits much more pilosity than the female.

Comparative Notes. Closely related to *C. callida* O. S. To be separated according to the key. Large series of both these species show such variation and intergradation that a point is reached where separation becomes extremely difficult. Distributional data would seem to indicate that *C. aestuans* is mostly confined to the North and Northwest. On the other hand, *C. callida* has a wider range, especially in its southern distribution. In the males, the apical spot of *C. aestuans* is narrower than in *C. callida*, and I have never seen a male of the latter with black antennae and palpi; also the male of *C. callida* shows a greater extent of yellow on the venter of the abdomen and legs.

Remarks. The above description is based mostly on specimens compared with the types of Walker's *C. moerens*. There is no doubt as regards their identity. As Philip (1931) pointed out, this name must fall since it is preoccupied by a *C. moerens* (Tabanus) of Fabricius (1794); therefore *C. aestuans* Van der Wulp becomes valid.

*Distributional Data:**

CANADA: Ontario 1, June 23.

UNITED STATES: New York 2, July 4 - Aug. 8; Michigan 3, July 2 - Aug. 8; Ohio 3, June 9; Indiana 2, July 9; Illinois 5, June 6 - Aug. 24; Minnesota 2, June 16 - July 15; North Dakota 1, June 16; South Dakota 4, June 28 - July 8; Kansas 4, June; Colorado 3, Aug. 9 - Aug. 27; Idaho 1; Utah 5, June 25 - July 7; Washington 4, June - July 13.

In addition, reported by others from:

CANADA: Manitoba, Saskatchewan, British Columbia.

UNITED STATES: Wisconsin, Nebraska, Oregon.

Chrysops amazon Daecke (1905)

(Plate XXXIII, fig. 61)

1905. *C. amazon* Daecke, Ent. News, XVI, 250, fig.

1907. *C. amazon* Daecke, Ent. News, XVIII, 140.

1926. *C. amazon* Kröber, Stett. Ent. Ztg., LXXXVII, 305.

Color. Predominantly black with short, white pubescence; dense fulvous pile on the pleurae.

Size. Length, 9 mm. to 11 mm.

* In order to save space I have condensed the distributional data from the original MS. The number immediately following province, state, territory, or district represents the number of different specific localities from which I have records. The dates represent earliest and latest collecting dates.

Structural and Color Characters. Female: Vertex, frons, sides of genae and a mid-streak on the frontoclypeus grayish pollinose. Frontal callus, ocellar area, remaining portions of frontoclypeus and genae, and the palpi fuscous to black. Antennae very slender; the scape and pedicel brownish-yellow, flagellum black apically. Dorsum of thorax and scutellum black with white pubescence, the former with two obscure, gray pruinose stripes, pleurae and thoracic venter black with some gray pruinosity, the former with conspicuous dense fulvous or orange pile. Abdomen entirely black or fuscous with sparse white pubescence. Wings as figured. Halteres black. Legs black; the base of the median and posterior tarsi light brown, the median tibiae also are somewhat lighter at the base. Male: Wholly black, with black pubescence and pilosity. Wing picture similar to the female except for a greater extent of infuscation in cells R and 2d M, leaving but a small hyaline space near their apices.

Comparative Notes. Besides *C. celer* O. S. this is the only other species included within the scope of this paper which has heavy orange pile on the pleurae. It is easily separated by the presence of an apical spot on the wing. Daecke (1905) relates *C. amazon* to *C. noctifera* O. S., from this species it will be readily distinguished by the pile on the pleurae, greater extent of the crossband and apical spot and absence of triangles on the abdomen.

Remarks. In the key I have placed this species with the group in which the apical spot of the wing includes more than just the apex of cell R_4 . A casual observation will no doubt give rise to dispute, but since the apical spot fades away into cell R_4 and beyond, until the eye cannot tell where the infuscation stops and the hyaline area begins, I feel justified in assigning *C. amazon* to the group mentioned above.

Type Data. I have studied the cotypes in the United States National Museum. According to Kröber (1926) there is one cotype in the Museum of Ottawa. Described from four females, all from Browns Mills Junction, New Jersey.

Distributional Data:

UNITED STATES: New Jersey: Browns Mills Junction, June 24, 1906.

In addition, reported by others from:

UNITED STATES: Massachusetts, New Hampshire.

Chrysops beameri, new species

(Plate XXIX, fig. 2; Plate XXXII, fig. 40; Plate XXXV, fig. 86)

Color. Yellow, with fuscous stripes on the dorsum of thorax and abdomen.

Size. Length, 8 mm.

Structural and Color Characters. Female: Frontal callus, frontoclypeus, genae and palpi yellow; the usual areas with yellow pollen; ocellar area stained brown. Antennae very slender, the flagellum thicker than the scape; scape and pedicel yellow with a few black hairs, flagellum mostly black. Dorsum of thorax, pleural and sternal regions yellowish pollinose with fuscous stripes, the median stripe of the thoracic dorsum often continues on to the yellow scutellum. Dorsum of abdomen yellow with four fuscous longitudinal stripes; venter of abdomen yellow with a broad, mid-ventral, brown stripe extending basally not beyond segment II, on each side a narrow stripe. Wings as figured. Legs predominantly yellow. Apical portion of front tibiae and entire tarsi, base of middle and hind femora and apical tarsal segments brown.

Comparative Notes. This species would fall in Kröber's so-called "Gruppe: vittatus." The hyaline triangle of the wings resembles that of *C. sequax* Will., but from this *C. beameri* differs by its yellow callus and scutellum. It may be separated from *C. pikei* Whit. by the complete lateral abdominal stripes, the greater extent of the hyaline triangle, and also by the yellow callus. From *C. hinei* Daecke it is distinguished by the hyaline triangle being broadly open at its base, cell Cu_1 hyaline, and the more pronounced yellow of the dorsum of the thorax and scutellum.

Type Data. Holotype, female; Comanche Co., Kansas; 2,089 feet, 1916, R. H. Beamer. Paratypes, eleven females; same data. In the Francis Huntington Snow Entomological Collection of the University of Kansas.

Remarks. Since describing this species I have seen several other specimens in the National Museum which appear to be *C. beameri*. One female from Woods Hole, Mass., Aug., 1920, by Leland Wood, and five females from Washington, D. C., Aug. 19, 1911, by Frederick Knab.

Chrysops bishoppi, new species

(Plate XXXI, fig. 26; Plate XXXVII, fig. 107)

Color. Yellow with black abdominal pattern; wing picture dilute.

Size. Length, 8 mm. to 10 mm.

Structural and Color Characters. Female: Vertex, frons and sides of genae yellow pollinose; frontal callus black; frontoclypeus and oral margins of genae denuded yellow; the pits on each side of the frontoclypeus and a tiny spot on the outer side of the oral margins of the genae, fuscous. Palpi yellow. Antennae variable; usually the scape and pedicel yellow with their outer and upper surfaces black, black pubescent; flagellum black, brown or yellowish at the base. Dorsum of thorax and scutellum green-gray pollinose, sparsely yellow pubescent, the former with three fuscous stripes; pleurae and venter yellowish-gray pollinose, the former with yellow pile. Dorsum of abdomen yellow; the first tergite with a black quadrate posteriorly emarginate spot beneath the scutellum, second tergite with a median black geminate figure, not attaining the posterior margin; tergites III and IV with a more or less double black geminate figure confined to the anterior half of the tergites; tergites V and VI more or less corresponding to the preceding, except the pattern seems to be composed of two posteriorly emarginate black spots confined to the anterior margins of the tergites; remaining tergite black with a yellow hind margin. Venter of abdomen yellow with a small median black spot on segment I which may connect with another on segment II; segments III to V usually with a trace of black in the center confined to the anterior margins; remaining segments black with yellow hind margins. Halteres brown. Wings as figured; the picture very dilute brown; usually the infuscation of cell R is interrupted by hyaline before the apex. Legs orange-yellow; the joints, apical portion of front tibiae and entire tarsi, apices of middle and hind tarsi, fuscous. Male: Quite similar to the female, easily associated, exhibiting the usual sex differences and more melanism. The black figures of the abdominal dorsum are more extensive, the median geminate spot on tergite II thicker, in one specimen a black spot is present on each side. Cell 2d M of the wing exhibits about the same degree of infuscation as R. Legs like the female, but with more fuscous as follows: Dominant on the front coxae, large basal portions of front and hind femora, and extreme base of middle femora.

Comparative Notes. Separated from *C. furcata* Walker by the dilute wing picture, different abdominal pattern, absence of a black

spot on each side of the frontoclypeus, and greater predominance of yellow on the abdomen and legs. The black frontal callus and abdominal picture should at once distinguish this species from *C. coloradensis* Bigot.

Remarks. Described from reared specimens variously determined as *C. coloradensis* Bigot and *C. furcata* Walker.

Type Data. Holotype: Female, Topaz, California, June 7, 1919, Bishopp, No. 9916. Allotype: Male, Topaz, California, July 16, 1917, Bishopp, No. 6164, Br. 2. Paratypes: Five males and nine females same locality, reared by Bishopp; May 16 to July 10, 1917; three females, Slinkard Valley, California, June 17, 1917; J. L. Webb. Holotype, allotype and eleven paratypes in the United States National Museum; catalog No. 50605. Six paratypes in the Francis Huntington Snow Entomological Collection of the University of Kansas.

Chrysops bistellata Daecke (1905)

(Plate XXXIII, fig. 63)

1905. *C. bistellatus* Daecke, Ent. News, XVI, 249, figs.
1907. *C. bistellatus* Daecke, Ent. News, XVIII, 141, fig.
1907. *C. bistellatus* Hine, Bull. 93, La. Exp. Sta., 26, fig.
1926. *C. bistellatus* Kröber, Stett. Ent. Ztg., LXXXVII, 238, figs.

Color. Yellow and brown; dorsum of thorax greenish gray with three brown stripes, scutellum yellowish, abdominal dorsum yellow with two broad, brown stripes converging anteriorly; hyaline triangle of wings represented by a small spot in cell R_3 .

Size. Length, 8 mm. to 9.5 mm.

Structural and Color Characters. Female: Vertex, frons and genae yellow pollinose; frontoclypeus and lower portion of genae denuded, yellow; frontal callus dark brown to black. Antennae slender, yellow; apical portion of flagellum black. Palpi yellow. Dorsum of thorax, pleurae and venter greenish gray to yellow-gray pollinose with the usual distinct broad, brown stripes; scutellum yellow or brown-yellow. Dorsum of abdomen yellow with two broad, brown stripes converging toward the base, but not attaining the first segment. Apical segments caudad from V mostly brown. Venter of abdomen predominantly yellow at the base and brown at the apex. Halteres dark brown. Wings as figured. Legs yellow and brown; front coxae, femora and proximal portion of tibiae, middle femora tibiae and proximal parts of middle and hind tarsi, yellow. Male: Unknown.

Comparative Notes. This species has little or no affinities with

other North American forms; it is most distinct and separable beyond question from any other species described to date.

Remarks. The male is not yet reported. Daecke's description goes into more detail and points out the extent of variability in the abdominal pattern. Both Daecke (1905) and Kröber (1926) have figured the dorsum of the abdomen and the wing. Kröber's figure of the abdominal pattern overaccentuates the apical extent of yellow.

Type Data. Described from sixteen females designated as cotypes; all from Browns Mills Junction, New Jersey, June 26, 1905. I have studied those in the United States National Museum and one cotype in the Snow Entomological Collection of the University of Kansas. (Two of these labeled June 27, 1904).

Distributional Data:

UNITED STATES: New Jersey, Browns Mills Junction, June 25, 1905, June 24, 1906, July 1, 1906, June 25, 1911, July 7, 1907. North Carolina, Lake Ellis, May 26, 1908.

In addition, reported by others from:

UNITED STATES: Louisiana.

Chrysops brimleyi Hine (1904)

(Plate XXXI, fig. 25)

1904. *C. brimleyi* Hine, Can. Ent., XXXVI, 55.

1907. *C. brimleyi* Daecke, Ent. News, XVIII, fig.

1909. *C. brimleyi* Greene, Ent. News, XX, 302, fig.; ♂ des.

1918. *C. brimleyi* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 196.

1926. *C. brimleyi* Kröber, Stett. Ent. Ztg., LXXXVII, 269.

Color. Fuscous with gray pruinosity and pubescence.

Size. Length, 6 mm. to 7 mm.

Structural and Color Characters. Female: Vertex, frons, and genae yellowish pollinose. Frontal callus, lateral projection of the yellow frontoelypeus, and lower margin of the genae, brown. Antennae slender, the flagellum exceeding the pedicel in thickness; scape and pedicel yellow, flagellum mostly black. Palpi brown. Dorsum of thorax and scutellum fuscous, light-gray pubescent. The fuscous ground color of the pleurae and venter gray pruinose, the former with whitish pile. Dorsum of abdomen fuscous with gray pubescence and narrow grayish hind margins on all the segments (in some specimens this last character is observed with difficulty); on the second and third segments the gray hind margins expand into small middorsal triangles, more or less distinct. Venter of abdomen shining fuscous. Halteres fuscous. Wings as figured. Legs brown; more dilute on the proximal portions of the anterior

tibiae, median and posterior tarsi, and most of the median tibiae. Male: According to Green (1909), "Like the female, except basal half of the antennae clothed with long, black hair. Frontal triangle gray pollinose, with the apex shining black. Thorax black, clothed with black hairs, no stripes visible. The abdomen black, with the posterior margins of all the segments, except the first, gray pollinose. The wings differ from the female in having the basal end of the black crossband reaching slightly beyond the middle of the anal cell. The first basal cell has two hyaline spots near the apex, and the second basal cell one. First submarginal cell with a hyaline spot at the base. The discal cell has a hyaline spot at the base, the fifth posterior cell has a semihyaline spot at the base and one at the apex. The apical spot reaches downward over the upper end of the marginal cell, covering about half of the first submarginal and nearly all of the second submarginal cell. A small, black spot at the apex of the posterior branch of the third vein. Length, about 8 mm."

Comparative Notes. Hine (1904) separates this species from *C. niger* Macq., from which it is distinguished by the presence of an apical spot on the wings, somewhat smaller size and different color. In this last character *C. brimleyi* resembles *C. fuliginosa* Wied., but is immediately separated by the wing picture, color of antennae, etc.

Remarks. I have not been able successfully to identify the male. The description given for the sex by Greene (1909) is not satisfactory. Obviously it is a description of a specimen and not a species. He states that it is based upon one specimen from Glassboro, New Jersey, May 19, 1907, and that the females were very common. The description sounds suspiciously like that of *C. fuliginosa* Wied., which species should also be found in that locality. The presence of an infuscated spot at the bifurcation of vein R_{4+5} and the general extent of the infuscation of the wing is certainly applicable to the male of *C. fuliginosa*. The length, 8 mm., seems large for *C. brimleyi*, especially a male.

Type Data. I have seen one metatype at the United States National Museum. Described from a number of specimens from Raleigh, N. C. April and May, 1902.

Distributional Data:

UNITED STATES: New Jersey 7, May 27, July 4; Maryland 1, May 25; Virginia 1, May 7, 10; North Carolina 1, April 28, June 15; Alabama 1, May 1.

In addition, reported by others from:

UNITED STATES: New York.

Chrysops brunnea Hine (1903)

(Plate XXIX, fig. 6; Plate XXXIV, fig. 75; Plate XXXV, fig. 81)

1903. *C. brunneus* Hine, Ohio State Acad. Sci. Spec. Pap. No. 5, p. 34.
1906. *C. brunneus* Daecke, Ent. News, VII, 41.
1907. *C. brunneus* Daecke, Ent. News, XVIII, 146.
1907. *C. brunneus* Hine, Bull. 93, La. Exp. Sta., 26, figs.
1918. *C. brunneus* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 197.
1926. *C. brunneus* Kröber, Stett. Ent. Ztg., LXXXVII, 258.

Color. Light brown.

Size. Length, 8 mm. to 10 mm.

Structural and Color Characters. Female: Frontal callus, frontoclypeus, genae, antennae, and palpi yellow; the usual areas with yellow pollen; apex of flagellum black. Scape and pedicel of antenna swollen, the former slightly more than the latter. Dorsum of thorax, pleurae and venter yellowish-gray to greenish gray pollinose with distinct brown stripes; scutellum yellow-brown to dark brown. Dorsum of abdomen yellow-brown to brown with more or less faint yellow-white middorsal triangles on segments II to V. Most specimens exhibit narrow, pale, hind margins to all segments except the first and second. Sometimes the middorsal triangles have, on each side near their apices, a small oblique fuscous spot. Venter of abdomen mostly yellow at the base and brown at the apex, occasionally the brown being prolonged toward the base to form an obscure broken midventral stripe on each side of which may appear a lateral streak. Halteres light brown. Wings as figured, the infuscation light brown. Legs yellow; the distal portion of the anterior tibiae and entire tarsi, and the four distal segments of the median and posterior tarsi, brown. Male: Like the female, except for sex characters. One specimen at hand shows considerable dark brown occupying the entire disc of the last five or six abdominal segments, the whitish middorsal triangles being obsolete.

Comparative Notes. Allied to *C. flavida* Wied.; however, that species is more yellow; the abdominal pattern is more conspicuous, the black markings being more prevalent; the wing picture is usually a darker brown, the apical spot of less extent; the scape and pedicel of the antenna much less swollen, in some instances would not be regarded as swollen at all. Hine (1903) states that the antennae of *C. brunnea* are noticeably longer than those of *C. flavida*. Daecke (1906) in his studies of the eye pattern of wing specimens has indicated that the occipital border in *C. brunnea* attains the hind margin of the eye, whereas in *C. flavida* it does not.

Type Data. I have studied Hine's types at the Ohio State

Museum. Described from many specimens taken at Sandusky, Ohio, from June to August, 1902.

Remarks. *C. guiterasi* Brun. May be a synonym of *C. brunnea*. I have not seen the type of *C. guiterasi*, but have seen one specimen (♀) from Cuba thus determined, and it apparently is the same as Hine's species.

Distributional Data:

CANADA: Ontario 1, Aug. 14, Aug. 17.

UNITED STATES: New York 3, June 29, July 26; New Jersey 1, Aug. 9; Maryland 1, July 2; Ohio 5, June 15, Aug. 8; Georgia 1; Florida 1, Aug. 10; Indiana 1, June 29; Louisiana 6, April 27, Sept. 5; Kansas 1, July 22; Texas 4, July 30, Sept. 20; Arizona 1.

In addition, reported by others from:

UNITED STATES: Virginia.

Chrysops callida Osten Sacken (1875)

(Plate XXXI, fig. 33)

- 1875. *C. callidus* Osten Sacken, Prodrôme, I, 379.
- 1887. *C. callidus* Williston, Trans. Kans. Acad. Sci., X, 132.
- 1895. *C. callidus* Townsend, Trans. Am. Ent. Soc., XXII, 56.
- 1903. *C. callidus* Hine, Ohio State Acad. Sci. Spec. Pap. No. 5, p. 35.
- 1906. *C. callidus* Daecke, Ent. News, XVII, 42.
- 1907. *C. callidus* Daecke, Ent. News, XVIII, 145, fig.
- 1907. *C. callidus* Hine, Bull. 93, La. Exp. Sta., p. 28, figs.
- 1917. *C. callidus* Marchand, Jl. N. Y. Ent. Soc., XXV, 150; biol.
- 1918. *C. callidus* McAtee and Walton, Proc. Ent. So. Wash., XX, 196.
- 1920. *C. callidus* Marchand, Mon. Rock. Inst. No. 13, p. 46, biol.
- 1924. *C. callidus* Wehr, Neb. Univ. Studies, XXII, 113.
- 1926. *C. callidus* Kröber, Stett. Ent. Ztg., LXXXVII, 284.
- 1930. *C. callidus* Schwardt and Hall, Bull. 256, Ark Exp. Sta., p. 14, fig.
- 1930. *C. callidus* Stone, Ann. Ent. Soc. Am., XXIII, 274, biol.
- 1931. *C. callidus* Schwardt, Jl. Kans. Ent. Soc., IV, 5, biol.
- 1931. *C. callidus* Philip, Minn. Tech. Bull. LXXX, 83.

The following also refers to this species:

- 1926. *C. moerens confusus* Kröber, Stett. Ent. Ztg., LXXXVII, 284, fig.

Color. Black, with middorsal yellow triangles on the abdomen and large pale yellow spots on the sides near the base.

Size. Length, 7 mm. to 9 mm.

Structural and Color Characters. Female: Vertex, frons, sides of genae, yellow pollinose. Frontal callus black. Basal segments of antennae, frontoclypeus, lower area of genae, and palpi orange-yellow; flagellum of antenna mostly black, except at extreme base. Ocellar area more or less denuded, dark brown. Dorsum of thorax and scutellum green-gray pollinose, the former with the usual three brown stripes; pleurae and venter with more yellowish pruinosity, with the usual brown stripes, the former with yellowish-white pile.

The yellow of the abdominal dorsum with a large quadrate black spot, under the scutellum, which practically attains a broad geminate black figure, on the second segment, which may or may not continue along the posterior margin, and sometimes expands into black lateral spots on the yellow of that segment; remaining segments black with yellow posterior margins which expand into mid-dorsal triangles on III, IV, and V, which sometimes have on each side a yellow oblique spot. Venter of abdomen usually yellow at the base, the black of the apical segments extending toward the base as a broad, broken median stripe with lateral streaks on each side. Wings as figured, sometimes the apex of cell M_3 is not infuscated. Legs yellow and black, the former color distributed as follows: anterior coxae and base of tibiae, median tibiae and metatarsi, proximal half of posterior tibiae and metatarsi. In a few specimens which I am sure are this species, the front coxae are black. Male: Similar to the female, except for sex characters; a more dense pubescence and pilosity; both cells R and 2d M infuscated except small hyaline areas near their apices; a greater portion of the legs black, i. e., the front coxae and most of the front and hind tibiae.

Comparative Notes. See under description of *C. aestuans* Van der Wulp. The yellow sides of the second segment of the abdominal dorsum often show evidence of black triangles encroaching from the posterior margin; this condition of course adds to the difficulties of separating these two species. Kröber (1926) separates his *C. moerens confusa* from *C. callida* principally on the extent of infuscation in cell M_3 , stating that the former shows this infuscation but half way, and the latter, completely; however, from large series of *C. callida* I am able to pick out specimens exhibiting both characters. The abdominal pattern is far too variable to be of much taxonomic value. In making measurements concerning the posterior convergence of the vertex in the females it was apparent that in general *C. callida* exhibits a greater convergence than *C. aestuans*, or to express it otherwise, the distance between the eyes across the ocellar area is greater in the latter than in the former.

Quoting from my notes taken on the types of *C. callida* O. S.: "As described. Abdomen quite variable, as indicated. Venter yellow basally, but not always entirely, for a brown spot may appear on I and II, as in one specimen. Wing pattern not wholly constant. No actual black triangles encroach on II of the dorsum, but a variation occurs which might permit this."

Remarks. It is self-evident that to undertake describing a new variety from one specimen of the group of that most variable and

difficult *aestuans-callida* complex, is a dangerous proceeding. But this is exactly what Kröber (1926) has done.

Dr. G. S. Walley of the Entomological Branch, Ottawa, Canada, very kindly compared a specimen of *C. callida* O. S. data: (La-Crescent, Minn., Marsh Flats, June 16, 1925, C. B. Philip; det. Philip) with Kröber's type of *C. moerens confusus* and comments as follows: "General dorsal abdominal pattern extremely similar to your specimen, and the second segment identical. Ventral aspect of abdomen: a gradually broadening mid-ventral fuscous stripe commences at base of abdomen and extends posteriorly, occupying the entire width of sternites 5, 6 and 7; midway between this and lateral margins on sternites 3 and 4 a narrow fuscous stripe which on 5 unites with the median one. Legs: Hind femora are uniformly brownish except for narrow black apices, not entirely blackish as in your specimen."

Because of the locality (British Columbia) I am puzzled as to whether or not *C. moerens confusa* Kröber is an aberrant *C. aestuans* Van der Wulp or *C. callida* O. S.; however, from point of separateness, comparison, and description it is more likely the latter species. To further verify my opinion, I have other typical specimens of *C. callida*, same data as specimen compared. I am much more at a loss to understand why Kröber has related his new variety to *C. coloradensis* Bigot, for there are scarcely any similarities.

Type Data. I have studied the types at the Museum of Comparative Zoölogy, and also the specimens of *C. aestuans* Van der Wulp which Osten Sacken used for comparison. Described from eleven females of which I was able to locate six. Osten Sacken (1875) gives as the habitat: New Jersey, Delaware, Connecticut, Detroit, Michigan, and Illinois.

Distributional Data:

CANADA: Ontario 1.

UNITED STATES: Maine 1, July 9; Massachusetts 3, July 1-10; Connecticut 2, June 13-30; New York 6, June 20 - July 25; New Jersey 5, June 20 - Aug. 28; Pennsylvania 3, June 19 - July 5; Delaware 3, June 7-10; Maryland 6, June 4 - July 5; Virginia 8, May 23 - June 18; District of Columbia 1, May 22 - June 14; Michigan 3; Ohio 20, May 24 - July 29; Indiana 1, June 6; Illinois 3, June 14 - July 5; Mississippi 1, July 17; Minnesota 4, June 16 - July 27; Nebraska 1, July 10; Kansas 8, June 12 - Aug. 1; Arkansas 1, April 12-14 (reared); Oklahoma 2, May 23-24; Texas 2, April 28 - June; Colorado 1, June 28.

In addition, reported by others from:

CANADA: Manitoba, British Columbia.

UNITED STATES: Louisiana, Florida, Wisconsin, Iowa, Washington.

Chrysops carbonaria Walker (1848)

(Plate XXX, fig. 20)

1848. *C. carbonarius* Walker, List, I, 203.
 1848. *C. carbonarius* Walker, var. γ , l. c.
 1901. *C. carbonarius* Ricardo, Ann. and Mag. N. H., ser. 7, VIII, 303.
 1904. *C. carbonarius* Hin., Ohio Nat., V, 220.
 1907. *C. carbonarius* Daecke, Ent. News, XVIII, 140.
 1918. *C. carbonarius* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 197.
 1924. *C. carbonarius* Wehr, Neb. Univ. Studies, XXII, 111.
 1926. *C. carbonarius* Kröber, Stett. Ent. Ztg., LXXXVII, 245.
 1930. *C. carbonarius* Stone, Ann. Ent. Soc. Am., XXIII, 275, biol.
 1931. *C. carbonarius* Philip, Minn. Tech. Bull., LXXX, 84.

The following also refer to this species:

1848. *C. niger* Walker (nec Macq.), List, I, 202.
 1850. *C. provocans* Walker, Dipt. Saund., pt. 1, p. 73.
 1850. *C. ater* Macquart, Dipt. Exot., Suppl., IV, 40.
 1875. *C. fugax* Osten Sacken, Prodrôme, I, 375.
 1887. *C. fugax* Williston, Trans. Kans. Acad. Sci., X, 132.
 1906. *C. fugax* Daecke, Ent. News, XVII, 41.

Color. Black.

Size. Length, 7 mm. to 9 mm.

Structural and Color Characters. Female: Vertex yellow-gray pollinose; frons, a streak on the frontoclypeus, sides of genae yellow pollinose. Frontal callus, frontoclypeus, genae and palpi fuscous to shining black; occasionally the palpi display some red-brown; the genae grayish to yellowish pilose. Antennae variable, usually the scape, pedicel and base of flagellum yellowish or reddish; apex of flagellum black. Dorsum of thorax and scutellum black with some green-gray pruinosity and whitish pubescence, the former with obscure gray stripes, pleurae and venter black with considerable green gray pruinosity, the former with gray-yellow pile. Abdomen black with sparse intermixed black and pale pubescence, sometimes on the sides near the base dark-gray pruinose; obscure gray mid-dorsal triangles sometimes present. Halteres black. Wings as figured, but there is a variable extent of infuscation and the presence of a hyaline spot at the base of cell M_3 is not always clearly defined. Legs black; the extreme base of the front and middle tibiae, the middle and hind metatarsi, yellow or reddish. Male: Like the female, except for a greater extent of infuscation in cells R and 2d M of the wings. The hyaline spot at the base of cell Cu_1 usually present. Cell 1st A and anal angle infuscated.

Comparative Notes. To be separated from *C. mitis* O. S. by the presence of a hyaline spot at the base of cell Cu_1 . Studied by series *C. carbonaria* is some smaller than *C. mitis*, and it appears that the latter is more apt to exhibit middorsal triangles. Easily separated

from *C. nigra* Macq. by the extent of infuscation in cells R and 2d M of the wings.

Remarks. Philip (1931) has given an excellent discussion concerning the variability and separateness of *C. carbonaria* and *C. mitis*. He has shown the difficulties involved in separating the adults, but in the final analysis, resorting to larval characters, verified the distinctness of these two species.

Type Data. The above description is based upon specimens compared with Walker's types by Major Austen at the British Museum. I have also studied the types (eight females) of *C. fugax* O. S. at the Museum of Comparative Zoölogy, Cambridge, Massachusetts. The synonymy of these two species is of too long standing to need further discussion. The type locality of Walker's species is Nova Scotia; Osten Sacken's, Canada, Maine, New Hampshire, Montana, Idaho, and the Yukon River.

Distributional Data:

CANADA: Newfoundland 1, Aug. 8; Quebec 4, May 20, July 24; Ontario 1, June 13; Manitoba 1, June 27; Northwest Territory 1, July 20, 28.

UNITED STATES: Maine 4, June 10 - July 20; Massachusetts 3, June 6 - July 15; New Hampshire 6, June 4 - July 7; New York 4, May - June 28; New Jersey 8, May 24 - July 2; Pennsylvania 2, June 3-21; Maryland 3, May 28 - June 25; Virginia 6, May 26 - July; North Carolina 1, May 15; Michigan 2, July 4 - Aug. 15; Ohio 1, June 4-14; Wisconsin 2, June 4; South Dakota 1; Wyoming 3, July 2-18; Colorado 4, June 20 - July 8; Montana 3, July 10-14; Idaho 1, July 6; Utah 1, July 4; California 1.

In addition, reported by others from:

CANADA: Nova Scotia.

UNITED STATES: Connecticut, Nebraska, Alaska.

Chrysops celer Osten Sacken (1875)

(Plate XXX, fig. 19)

- 1875. *C. celer* Osten Sacken, Prodrôme, I, 376.
- 1903. *C. celer* Hine, Ohio State Acad. Sci. Spec. Pap. No. 5, p. 36.
- 1906. *C. celer* Daecke, Ent. News, XVII, 41.
- 1907. *C. celer* Daecke, Ent. News, XVIII, 39.
- 1918. *C. celer* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 197.
- 1920. *C. celer* Marchand, Mon. Rock. Inst. No. 13, p. 47.
- 1926. *C. celer* Kröber, Stett. Ent. Ztg., LXXXVII, 244.
- 1930. *C. celer* Stone, Ann. Ent. Soc. Am., XXIII, 279, biol.
- 1931. *C. celer* Schwardt, Jl. Kans. Ent. Soc., IV, 7, biol.
- 1931. *C. celer* Philip, Minn. Tech. Bull., LXXX, 84.

Color. Black, the female with dense orange pile on the pleurae.

Size. Length, 8 mm. to 11 mm.

Structural and Color Characters. Female: Vertex, frons, a broad longitudinal stripe on the frontoclypeus, sides of genae, yellow or gray-yellow pollinose; frontal callus, ocellar area, frontoclypeus and

oral regions of genae, black. Antennae reddish-yellow except the black apex of the flagellum. Palpi reddish-brown to fuscous. Thoracic dorsum and scutellum black with white pubescence, the former faintly striped with gray; pleurae and venter black with grayish pruinosity, the former with dense orange pile. Dorsum of abdomen black with white pubescence and more or less indistinct gray middorsal triangles on segments II and III. Venter of abdomen black with white pubescence. Ocelli brown. Wings as figured. Legs black; middle and hind metatarsi yellow; the front coxae, middle and hind femora with white hairs. Male: Differs from the female as follows: The antennae are mostly black; pleurae black pilose; cell 1st A of the wings infuscated, and a greater extent of infuscation in cells R and 2d M.

Comparative Notes. Distinguished from *C. amazon* Daecke by the absence of an apical spot on the wing. The females are readily separated from other species of the group lacking an apical spot by the heavy orange pile of the pleurae. Hine (1903) states, "The male is distinguished from that of *niger* by the hyaline spots at the apex of the basal cells, occupying the whole width of these cells; and from that of *fugax* (*C. carbonaria* Walker) by the crossband practically filling out the fourth posterior cell." From *C. excitans* Walker the male is separated by the wholly black pubescence of the abdomen and entirely black antennae.

Remarks. Ricardo (1901) doubtfully makes *C. celer* O. S. and *C. cincticornis* Walker synonyms. In this she has been followed by others, all with a doubt. Major Austen of the British Museum has compared one of my specimens of *C. celer* with Walker's type of *C. cincticornis* and asserts that they are not the same.

Type Data. Described from eight females of which I have seen four. In the Museum of Comparative Zoölogy, Cambridge, Massachusetts. Habitat given as Middle States and Massachusetts.

Distributional Data:

CANADA: Quebec 4, July 1-27; Ontario 3, June 7 - July 19.

UNITED STATES: Maine 2, July 3-17; Massachusetts 3, June 17 - July 15; Connecticut 1, July 21; New York 3, May 27 - July 27; New Jersey 4, May 20 - June 21; Pennsylvania 4, June 8 - July 8; Maryland 4, May 25 - June 18; Virginia 7, May 24 - June 19; North Carolina 2, May 4-7; Michigan 1, June 29; Ohio 6, May 20 - July 1; Indiana 1, May 27; Illinois 1, June 12-13; Oklahoma 1, May 29.

In addition, reported by others from:

CANADA: Newfoundland, Nova Scotia, Saskatchewan.

UNITED STATES: District of Columbia, Wisconsin, Minnesota, Arkansas.

Chrysops clavicornis, new species

(Plate XXIX, fig. 8; Plate XXXIV, fig. 64; Plate XXXV, fig. 85;
Plate XXXVII, figs. 105, 110)

Color. Yellow, with black abdominal pattern; appendages yellow.

Size. Length, 7 mm. to 8 mm.

Structural and Color Characters. Female: Vertex, frontal callus, frontoelypeus, genae, and palpi yellow, the usual regions with yellow pollen. Ocellar area, a margin around the callus, and a spot on the genae, brown. Vertex and genae with rather dense pile. Scape and pedicel of antenna yellow with black hairs, flagellum mostly black; the bottle-shaped scape is distinctly swollen. Dorsum of thorax and scutellum yellow-gray pollinose, yellowish pilose, the former with faint brown stripes. Pleurae and sternal region yellow-gray pollinose with fuscous stripes, the former with dense yellow-white pile. Dorsum of abdomen yellow with a quadrate black spot under the scutellum which nearly unites with the geminate spot of the second segment. Segments III, IV and V usually with a double geminate black spot; the remaining segments black; all with yellow posterior margins. Sometimes a small black lateral spot appears on segment II, in one specimen also on segment I. Venter of abdomen yellow with a complete fuscous mid-stripe and two lateral stripes. Wings as figured, the hyaline triangle sometimes more broadly open at the base; in one specimen the apical spot definitely ending in cell R_5 . Legs yellow; all joints, apical portion of front tibiae and entire tarsi, apical tarsal segments of middle and hind legs, fuscous. Posterior tibiae with rather long, black hairs. Male: Predominantly black. Head and its appendages as described for the female except the sex characters. Thorax and scutellum exhibit more brown ground color, more densely pilose. First abdominal segment almost entirely black except the yellow lateroposterior margin; second with a large trapezoidal black spot encroached upon from the posterior margin by a yellow triangle, the yellow on each side with a black spot; the remaining segments as in the female, except that black is more dominant. Venter of abdomen yellow with three black stripes. Wing picture like the female, except that the infuscation of cell 2d M is equal to that of cell R, and the base of cell 1st A is infuscated. Legs as described for the female, in addition, the apical portion of the front femora and of the hind tibiae are fuscous.

Comparative Notes. The abdominal pattern resembles that of *C. coquilletti* Hine, from which *C. clavicornis* may be separated by the much greater extent of the apical spot and the more narrow hyaline triangle. The characteristic bottle-shaped scape of the

antenna generally does not appear to be so swollen as in any of the related species.

Type Data. Holotype, female; San Diego Co., California; July 7, 1929, R. H. Beamer. Allotype, male; same data. Paratypes: four females, same data; one female, same locality and date, Paul W. Oman; one female, Los Angeles Co., California; one female, Riverside, California, Mission Inn, September 3, 1930, D. Martin; four females, Ontario, California, July 10-13, 1917. In the Francis Huntington Snow Entomological Collection of the University of Kansas. The Ontario, California, paratypes in the Ohio State Museum.

Chrysops coloradensis Bigot (1892)

(Plate XXXI, fig. 34)

1892. *C. coloradensis* Bigot, Mem. Soc. Zool. France, V, 605.

1901. *C. coloradensis* Ricardo, Ann. and Mag. N. H., ser. 7, VIII, 307.

1904. *C. coloradensis* Hine, Ohio Nat., V, 220.

1926. *C. coloradensis* Kröber, Stett. Ent. Ztg., LXXXVII, 293.

Color. Tawny with black abdominal pattern, and considerable yellowish pubescence throughout.

Size. Length, 8 mm. to 10 mm.

Structural and Color Characters. Female: Frontal callus yellow, margined above with brown; frontoelypeus, genae and palpi orange-yellow; the pits on each side of the frontoelypeus and a small spot near the oral margin of the genae, brown; the usual areas yellow pollinose. A brown line usually connects the more or less denuded ocellar area and the frontal callus. Antennae yellow and black as follows: Scape and pedicel on inner and lower surfaces yellow, on outer and most of upper surfaces black, with black pubescence; flagellum yellowish at base, black at apex. Dorsum of thorax and scutellum green-gray to yellow-gray pollinose, the former with three broad, brown stripes, the latter sometimes appears plumbeus. The pruinosity of the pleurae and venter of the thorax broken by the usual brown stripes. Dorsum of abdomen tawny yellow with a black emarginate quadrate spot beneath the scutellum, not attaining the hind margin of the first segment; second segment with two obliquely angulate black spots on the disc, not attaining either margin; in addition to these spots on the third, fourth and fifth segments is a black lateral spot, often the black figures on these segments may be in the form of two geminate spots; remaining segments black with yellow hind margins. Venter of abdomen yellow, usually with a mid-ventral brown stripe and the usual lateral ones; apical segments brown with yellow hind margins. I have one specimen without a trace of a mid-ventral stripe. Halteres yellow

with brown knobs. Wings as figured. Legs yellow; all joints, apical portion of anterior tibiae and entire tarsi, the four distal segments of the median and posterior tarsi, brown. Male: In general this sex resembles the female and is not difficult to associate with it. There is a greater extent of black on the dorsum of the abdomen, segments II and IV each with a double geminate spot. The infuscation of cell 2d M of the wing equals or slightly exceeds that of cell R₁, likewise there is a greater infuscation along veins Cu₁ and Cu₂. Legs as in the female except the front coxae, large basal portion of front and hind femora, and middle femora at the base, fuscous.

Comparative Notes. Hine (1904) has related *C. coloradensis* to *C. proclivis* O. S., but it appears more closely allied to *C. furcata* Walker, from which it may be separated by the yellow frontal callus and generally greater extent of yellow in the facial regions, and the two spots on the second abdominal tergite instead of a single geminate one. In both *C. proclivis* and *C. furcata* the prevailing yellow is more orange whereas in *C. coloradensis* it is more tawny. Kröber (1926) states, “. . . grosse Ähnlichkeit mit *furcatus* (*C. montana*), *lupus* (*C. furcata*) und *moerens* (*C. aestuans*).” Ricardo (1901) redescribes the type and she also relates this species to *C. furcata* Walker.

Remarks. This is the first time that the male of this species has been described. My notes are based on a single specimen in the United States National Museum from Topaz, California.

Type Data. Two females from Colorado. In the British Museum. The other specimens of the series are *C. fulvastra* O. S. See Ricardo (1901).

Distributional Data:

UNITED STATES: Nevada, Fallon, June 17-18, 1930; Pyramid Lake, July 16, 1911. California, Oreville, May 11, 1921; Orange Co., July 14, 1929; Topaz, July 8-10, Aug. 12, 1919. Santa Cruz Mts., Plumas Co., March.

In addition, reported by others from:

UNITED STATES: Colorado, Washington, Oregon.

Chrysops coquilletti Hine (1904)

(Plate XXXIV, fig. 65; Plate XXXV, fig. 84; Plate XXXVII, figs. 111, 112)

1904. *C. coquilletti* Hine, Ohio Nat., V, 220.

1926. *C. coquilletti* Kröber, Stett. Ent. Ztg., LXXXVII, 263.

Color. Yellow, with black abdominal pattern; appendages mostly yellow.

Size. Length, 8 mm. to 9 mm.

Structural and Color Characters. Female: Vertex broader than long, yellow pollinose; sides of genae and a midstreak on the frontoclypeus yellow pollinose; region immediately surrounding antennae white pollinose; ocellar area denuded, black; frontal callus yellow margined above with black; frontoclypeus and oral margin of genae yellow, the latter with a small fuscous spot. Palpi yellow. Antennae incrassate, the scape extremely bulbous, practically swollen uniformly throughout; both scape and pedicel yellow with black pubescence; flagellum black except for a little yellow at the base. Dorsum of thorax and scutellum fuscous, pruinose, with yellowish pile, the former with gray-yellow pollinose stripes; pleurae and venter gray-yellow pollinose with the usual brown stripes, the former with yellowish pile. Dorsum of abdomen yellow with a quadrate black spot beneath the scutellum, posteriorly emarginate; second segment with a heavy geminate black mid-spot which attains the anterior margin; segments III, IV and V each with four black spots, the median pair the larger and conforming more nearly to the geminate spot on segment II; remaining segments mostly black with yellow hind margins. Venter of abdomen yellow with a black median stripe and the usual black lateral stripes; apical segments black with yellow hind margins. Halteres yellow. Wings as figured; the apical spot including less than half of cell R_4 . Legs yellow, all the joints, apical portion of front tibiae and entire tarsi, the four apical segments of the middle and hind tarsi, black. Male: Like the female, except for sex characters. The dorsal abdominal pattern differs as follows: The black quadrate spot beneath the scutellum is more extensive, scarcely emarginate posteriorly, and practically coalesces with the black geminate figure on the second tergite; on the third tergite the median pair of angular black spots are much smaller; remaining tergites like the female. Venter of abdomen like the female. Wings like the female; the base of cell 1st A is hyaline, the extent of infuscation into cell 2d M is not more than in the female. Legs like the female; in one specimen the apical portion of the hind tibiae is black.

Comparative Notes. This species is generally larger than *C. pachycera* Will. and as a rule both sexes exhibit much more black on the abdomen; in the female the infuscation of cell 2d M in *C. pachycera* is more confined to the base than in *C. coquilletti*, where it often continues tapering toward vein M and ending with the infuscation of cell R; however, in the male, the infuscation of cell 2d M in the former is more extensive than in the latter; frequently the

wing picture of *C. pachycera* is fenestrate, but I have never seen this condition in *C. coquilletti*. From *C. clavicornis* n. sp. *C. coquilletti* may be easily separated by the scape of the antennae, which is practically barrel-shaped and extremely swollen; in the former the scape is not so swollen and is typically bottle-shaped; also the extent of the apical spot of the wing in *C. clavicornis* is considerably greater than in *C. coquilletti*. Also see under description of *C. robusta* n. sp.

Remarks. Part of Hine's types are my *C. clavicornis*. See under type data.

Type Data. Two females and one male labeled "cotypes" in the Ohio State Museum. One female, Los Angeles Co., California, April, collection Coquillett, I accept as the true *C. coquilletti* Hine and hereby designate this specimen as the lectotype. One female, Pasadena, California, June 12, 1895, R. W. Doane, is my *C. clavicornis*; the bottle-shaped scape of the antenna, the extent of the apical spot of the wing into cell R_5 , and a black lateral spot on the second abdominal tergite easily identify this specimen. One male, Los Angeles Co., California, collection Coquillett, conforms well to my male of *C. clavicornis*.

Distributional Data:

UNITED STATES: California: Dulzura, May 15, 1917; Poway Co., San Diego Co., April 12, 1930; Los Angeles Co., April; Lindsay. Utah: Zion National Park.

Chrysops cuclux Whitney (1879)

(Plate XXX, fig. 14)

1879. *C. cuclux* Whitney, Can. Ent., 35.

1906. *C. cuclux* Daecke, Ent. News, XVII, 404.

1907. *C. cuclux* Daecke, Ent. News, XVIII, 140.

1918. *C. cuclux* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 197.

1926. *C. cuclux* Kröber Stett. Ent. Ztg., LXXXVII, 253.

1930. *C. cuclux* Stone, Ann. Ent. Soc. Am., XXIII, 280, biol.

1931. *C. cuclux* Philip, Minn. Tech. Bull., LXXX, 85.

The following also refers to this species:

1901. *C. cuchix* Ricardo, Ann. and Mag. N. H., ser. 7, VIII, 300.

Color. Fuscous, abdomen with a gray-yellow spot on each side near the base, crossband of wings not saturate.

Size. Length, 7 mm. to 9 mm.

Structural and Color Characters. Female: Frontal callus, ocellar space, frontoclypeus and oral margins of genae, dark brown; vertex, frons, sides of genae, and a broad, longitudinal stripe on the frontoclypeus, grayish-yellow to creamy yellow pollinose. Antennae rather slender; the scape and pedicel yellowish, flagellum black except for

a little yellow at the base. Palpi brown. Thoracic dorsum and scutellum black with whitish pubescence; pleurae and venter with the black ground color hidden by some gray pruinosity, the former with yellow-white pile. Dorsum of abdomen fuscous with whitish pubescence; the sides of the first two segments deeply encroached upon by gray-yellow spots. Venter of abdomen fuscous with whitish pubescence. Halteres fuscous. Wings as figured, the picture dilutely infuscated. Legs brown except the yellowish median and posterior metatarsi. Male: Similar to the female in all respects except for the usual sex characters, and hence easily associated.

Comparative Notes. Whitney (1879) compares this species to *C. sordida* O. S., stating, “. . . but is smaller, lacks the gray posterior margins of the abdominal segments, the crossband is more abbreviated and lighter colored, and the second basal cell is further infuscated.” *C. cuclux* is a distinct species and should offer no difficulties in separating it from any of the group lacking the apical spot on the wing.

Remarks. This is the first time the male has been reported.

Type Data. Described from seventeen females, all taken at Milford, New Hampshire, in June. Four of these are still preserved at the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

CANADA: Nova Scotia 1, June 24; Quebec 2, May 24.

UNITED STATES: Maine 3, June 18-28; Massachusetts 3, June 16; New Hampshire 4, May 30-June; Connecticut 1, June 23-24; New York 4, May 30-June 29; New Jersey 1; Pennsylvania 2, June 22; Michigan 2, June 10-July 6; Ohio 4, June 1-8.

In addition, reported by others from:

CANADA: Ontario.

UNITED STATES: Maryland, North Carolina.

Chrysops cursim Whitney (1879)

(Plate XXXII, fig. 44)

1879. *C. cursim* Whitney, Can. Ent., XI, 36.

1887. *C. cursim* Williston, Trans. Kans. Acad. Sci., X, 134 (syn. of *C. pudica* O. S.).

1901. *C. cursim* Ricardo, Ann. and Mag. N. H., ser. 7, VIII, 300.

1906. *C. cursim* Daecke, Ent. News, XVII, 41.

1907. *C. cursim* Daecke, Ent. News, XVIII.

1914. *C. cursim* Whitney, Can. Ent., XLVI, 345.

Color. Yellow, with more or less faded black abdominal pattern; crossband of the wings very dilute.

Size. Length, 7 mm. to 8 mm.

Structural and Color Characters. Female: Frontal callus, frontoclypeus, genae, palpi, basal segments of antennae yellow; the usual

areas pollinosed, including the ocellar space; flagellum of antennae black apically. Dorsum of thorax and scutellum with gray-yellow pollen, the former with brown stripes; pleurae and venter pruinose with the usual stripes. Dorsum of abdomen yellow with an inverted V-shaped black spot on the second segment which does not attain either margin; the remaining segments with more or less emarginate black bands on their anterior margins; sometimes these figures conform more or less to the spot on segment II. Venter of abdomen yellow, only the extreme apex fuscous. Halteres yellowish. Wings as figured, the dilute crossband inclined to be irregular. Legs yellow; apical portions of front and hind femora and tibiae, entire front tarsi and distal four segments of middle and hind tarsi, brown. Male: Similar to the female except for the usual sex characters and the crossband usually more saturate.

Comparative Notes. This species is related to *C. pudica* O. S. of which Williston (1887) considers it a synonym. Kröber (1926) follows Williston, but undoubtedly lacks any other evidence. I have seen no intergrading forms, so I prefer to consider these as two distinct species. *C. cursim* exhibits more yellow throughout; the crossband is much more dilute and usually more irregular; the frontal callus is always yellow, sometimes margined above with brown. In *C. pudica* the frontal callus is variable, often brown; the dorsum of the thorax and scutellum are more plumbeous; the hind femora are mostly fuscous at the base; a black spot is usually present beneath the scutellum; both the dorsum and venter of the abdomen exhibit a greater extent of black.

Type Data. Described from six females, Milford, N. H., June.

Distributional Data:

UNITED STATES: New Jersey 4, June 16 - July 20; Maryland 2, June 5 - July 19; North Carolina 3, May 23 - June 16; Florida 4, April 12 - June 6.

In addition, reported by others from:

UNITED STATES: New Hampshire, Massachusetts, Connecticut, New York, Pennsylvania.

Chrysops delicatula Osten Sacken (1875)

(Plate XXXI, fig. 31)

1875. *C. delicatulus* Osten Sacken, Prodrôme, I, 380.

1906. *C. delicatulus* Daecke, Ent. News, XVII, 42.

1907. *C. delicatulus* Daecke, Ent. News, XVIII, 144.

1926. *C. delicatulus* Kröber, Stett. Ent. Ztg., LXXXVII, 265.

Color. Predominantly black with creamy yellow abdominal triangles.

Size. Length, 6.5 mm. to 8 mm.

Structural and Color Characters. Female: Vertex, frons, sides of genae, ocellar area, yellow to creamy yellow pollinose; frontal callus a spot on each side of the frontoclypeus, a spot on the oral area of the genae dark brown to black; frontoclypeus, palpi, scape and pedicel of antenna reddish yellow; flagellum of antenna black except the reddish basal portion. Thoracic dorsum, pleurae and venter gray-yellow pruinose with the usual brown stripes. Scutellum plumbeus. Dorsum of abdomen yellow with a black quadrate spot beneath the scutellum, not quite attaining a black geminate figure on the second segment which may or may not continue along the posterior margin; remaining segments black, the yellow hind margins of III, IV and V expanding into small middorsal triangles. Venter of abdomen yellow, the anterior margins caudad from III, black; black lateral streaks usually present. Halteres fuscous. Wings as pictured. Legs black; the proximal portion of the front tibiae, nearly all of the middle tibiae, the middle and hind metatarsi, reddish yellow. Male: Not identified; probably much like the female except for greater melanism.

Comparative Notes. To be separated from *C. callida* O. S. by its generally smaller size; the crossband of the wings attenuated posteriorly; and the brown spots on the frontoclypeus and genae.

Type Data. Described from two females from North Conway, New Hampshire, middle of August, 1874. I have studied both specimens; they have faded somewhat, but otherwise are in good condition. In the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

UNITED STATES: Maine 1, June; New Hampshire 1, Aug.; Connecticut 1; New York 1, June 29; New Jersey 4, June 24 - July 4; Michigan 2, July 3-14.

In addition, reported by others from:

CANADA: Ontario.

Chrysops dimmocki Hine (1905)

(Plate XXXI, fig. 30)

1905. *C. dimmocki* Hine, Ohio Nat., VI, 393.

1906. *C. dimmocki* Daecke, Ent. News, XVII, 41.

1907. *C. dimmocki* Daecke, Ent. News, XVIII, 145.

1918. *C. dimmocki* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 197.

1926. *C. dimmocki* Kröber, Stett. Ent. Ztg., LXXXVII, 294.

Color. Black, with yellow abdominal triangles.

Size. Length, 7.5 mm. to 9 mm.

Structural and Color Characters. Female: Vertex, frons and side

of genae with gray-yellow pollen; frontoclypeus, genae, palpi and basal segments of antennae, yellow; flagellum of antenna yellow basally and black apically; frontal callus variable, black to yellow. Dorsum of thorax greenish-gray pollinose with three brown stripes; pleurae and venter grayish-yellow pollinose with the usual brown stripes; scutellum concolorous with thoracic dorsum, sometimes yellow at the tip. First abdominal tergite with a quadrate black spot beneath the scutellum, not attaining the posterior margin; second tergite with an inverted V-shaped or geminate black spot attaining the anterior margin and may or may not follow along the posterior margin; remaining segments more or less black, the yellow posterior margins expanding into middorsal triangles. Venter of abdomen yellow, a black spot, successively increasing in size on segments III, IV and V; remaining segments black with yellow hind margins; the usual brown lateral streaks present. Wings as figured. Legs yellow; the joints, apical portion of front tibiae and entire tarsi, large basal portion of hind femora, apex of hind tibiae, apical four tarsal segments of middle and hind legs, fuscous. Male: I have but one specimen which I believe to be the male of this species. Superficially it approximates this sex in *C. sackeni* Hine, but the greater extent of infuscation in cell 2d M and the broader apical spot offer separable characters. It differs from the female as follows: Thoracic dorsum and scutellum darker; the median yellow triangles on the abdominal dorsum practically obsolete, tergites III and IV yellow on the sides; the black quadrate median spots of the venter attain the base; cells R and 2d M of the wing considerably infuscated except for a small hyaline space near their apices, cells Cu₁ and 1st A more extensively infuscated. Legs fuscous, bases of front and hind tibiae, entire middle tibiae, middle and hind metatarsi, yellow.

Comparative Notes. This species is related to *C. pudica* O. S., from which it should be separated by the greater extent of the apical spot into cell R₄. In general there is a greater extent of black on the abdominal dorsum of *C. dimmocki*, and the vertex of the median figure on the second tergite reaches the anterior margin. Based on the original descriptions these two could be separated by the black frontal callus in *C. dimmocki* and the yellow one in *C. pudica*, but unfortunately this character is variable in each species. The characters offered by the apical spot of the wing and the dorsal abdominal pattern have thus far proved most useful, although I have at hand specimens which show intergradation.

Type Data. I have studied the types. Described from one

female, Longmeadow, Massachusetts, and eight other specimens from Columbus and Wauseon, Ohio; and Anglesea and Westfield, New Jersey. Five cotypes in the Ohio State Museum.

Distributional Data:

UNITED STATES: Massachusetts 1, July 24; Connecticut 1, June 27 - July 22; New York 3, June 23-31; New Jersey 2, June 11-19; Virginia 1, Aug. 14; North Carolina 1, May 8-27; Georgia 1, May 9 - June 8; Florida 1, March 17; Ohio 2, June 12-14.

In addition, reported by others from:

UNITED STATES: Rhode Island.

Chrysops discalis Williston (1880)

(Plate XXXIV, fig. 72)

1880. *C. discalis* Williston, Trans. Conn. Acad. Sci., VI, 245.

1904. *C. discalis* Hine, Ohio Nat., V, 221, ♂ desc.

1921. *C. discalis* Francis, Public Health Reports, XXXVI, 1731-1792 (Transmission of tularaemia).

1922. *C. discalis* Francis and Mayne, Bull. 130, U. S. Pub. Health Service, Hyg. Lab., p. 8.

1924. *C. discalis* Wehr, Neb. Univ. Studies, XXII, 112.

1926. *C. discalis* Cameron, Bull. Ent. Res., XVII, 18 (larva and pupa).

The following also refers to this species:

1926. *Heterochrysops discalis* Kröber, Stett. Ent. Ztg., LXXXVII, 236.

Color. Female: Gray to yellow-gray with black spots on the abdomen, the wing picture fenestrate. Male: Predominantly black with yellow-gray spots on the abdomen, the wing picture fenestrate.

Size. Length, 8 mm. to 10.5 mm.

Structural and Color Characters. Female: Vertex, frons, ocellar area, sides of genae, and a broad stripe the full length of the frontoclypeus creamy yellow pollinose; frontal callus and a small spot on the frontoclypeus just next the pollinose stripe, black; remainder of frontoclypeus, a spot on the oral margin of the genae, and palpi pale yellow. Antennae mostly black, the scape and pedicel often yellowish on their inner and lower surfaces, with black and white pubescence intermixed. Dorsum of thorax and scutellum gray-yellow pollinose, the former with three brown stripes; pleurae and venter gray-yellow pollinose with the usual brown stripes, the former with dense yellow-white pile. Dorsum of abdomen gray yellow with a black spot, broader than long, beneath the scutellum, not attaining the hind margin of the first segment; second segment with two black angular spots on the disc whose bases attain the anterior margin and whose apices are directed toward the posterior margin which they do not reach; on the remaining segments those

spots become successively smaller; in some specimens the extreme apical segments are mostly black with yellowish hind margins; in addition to these markings, all segments have a black spot on each side. Venter of abdomen yellow with a black spot on the disc of each segment becoming successively larger toward the apex; the usual lateral streaks appear as dotted lines. Halteres yellow with brown knobs. Wings as figured, the hyaline discal cell and spot at the bifurcation of vein R_{4+5} are quite characteristic. Legs yellow; the joints, apical portion of front tibiae and entire tarsi, the proximal four segments of the middle and hind tarsi, brown. Male: Darker than the female, but readily associated. Head similar to that of female except for sex characters; the antennae wholly black. Dorsum of thorax and scutellum predominantly black, the former with gray pollinose stripes; pleurae and venter black with pollinose stripes, the pile of the former black and white intermixed. Dorsum of abdomen with first segment entirely black except for a small yellow lateral spot; remaining segments black, the gray-yellow posterior margins encroaching to form middorsal triangles, on each side of which is a longer spot almost attaining the anterior margin of the segment; segments VI and VII mostly black with narrow yellow hind margins. Venter of abdomen like the female, except the black occupies more space. Wing picture like the female except a much greater extent of infuscation in all cells. Legs black; the extreme base of the front tibiae, apex of middle femora, middle and hind tibiae except extreme apices, middle and hind metatarsi, yellow.

Comparative Notes. *C. discalis* is distinct from all other North American species. The general color and wing pattern is suggestive of *C. fulvastra* O. S., but the swollen antennae of that species, smaller size, etc., will easily separate it.

Type Data. One female in the Snow Entomological Collection of the University of Kansas.

Distributional Data:

UNITED STATES: North Dakota 1. June 26 - July 19; Nebraska 1, July 10; Wyoming 5, June 23 - Aug. 3; Colorado 1, June 28; Utah 14, May 17 - Aug. 27; Nevada 3, June 10 - July 17; Washington 1. Sept. 4; Oregon 3, July 15-30; California 3, May 8 - Aug. 13.

In addition, reported by others from:

CANADA: Manitoba, Saskatchewan.

UNITED STATES: Montana.

Chrysops dissimilis, new species

(Plate XXXIV, fig. 73; Plate XXXV, fig. 79)

Color. Orange-yellow with black abdominal pattern.

Size. Length, 7 mm. to 8 mm.

Structural and Color Characters. Female: Vertex slightly longer than broad, gray-yellow pollinose; frons, a midstreak on the frontoclypeus and sides of genae gray-yellow pollinose. Frontal callus brown-yellow, broadly bordered on the sides and above with fuscous. Frontoclypeus and oral margins of genae, except for a small fuscous spot on each side of the latter, orange-yellow. Palpi orange-yellow, sometimes with some fuscous intermixed. Antennae orange-yellow except for the black apical portion of the flagellum, sometimes the outer sides of the pedicel fuscous; both scape and pedicel with short, black hairs, the former more or less bottle-shaped and distinctly more swollen than the latter. Dorsum of thorax and scutellum yellow-gray or mouldy-gray pollinose, white pubescent, the former with obscure stripes; pleurae and venter gray-yellow pollinose, with yellow-white pile. Dorsum of abdomen orange-yellow, the black quadrate spot beneath the scutellum barely attaining the posterior margin of the first segment; the median black figure of the second segment is quite variable, sometimes appearing as two vittate spots parallel or posteriorly divergent, sometimes as a geminate or inverted V-shaped spot which rarely attains the anterior margin of the segment and never the posterior; segments III, IV and V each with a pair of median black vittate spots which attain the anterior, but not the posterior margins; sometimes small, black lateral spots are present, the pattern of segment V very obscure; remaining segments dominantly fuscous with yellow hind margins. Venter of abdomen orange-yellow, as a rule, with a distinct fuscous mid-stripe broadening toward the apex; the usual fuscous lateral stripes present. Halteres yellow. Wings as pictured. Legs orange-yellow; the joints, apical portion of front tibiae and entire tarsi, apical four segments of middle and hind tarsi, fuscous. Male: Except for sex characters, much like the female and easily associated. The black quadrate spot beneath the scutellum is larger and practically attains the hind margins of the first abdominal segment; the median figure on the second segment is more nearly a black quadrate spot posteriorly emarginate, than a geminate spot, as in the female. Wings and legs like the female. This sex exhibits less variation in the dorsal abdominal pattern. The lateral spots on segments III to V are lacking.

Comparative Notes. This species is quite distinct from all other North American Chrysops. The relatively narrow apical spot of the wing associated with an incrassate scape is unique. The abdominal pattern of the female is very similar to that of *C. pachycera* Will.

Type Data. Holotype, female; Lost River, Chaves Co., N. Mex., July 10, 1933, J. M. Brennan. Allotype, male; same data. Paratypes, seven males and twenty females; same data. In the Francis Huntington Snow Entomological Collection of the University of Kansas.

Chrysops divisa Walker (1848)

(Plate XXX, fig. 22)

1848. *C. divisus* Walker, List, I, 204.

1901. *C. divisus* Ricardo, Ann. and Mag. N. H., ser. 7, VIII, 303 (syn.).

The following also refers to this species:

1875. *C. atropos* Osten Sacken, Prodrome, I, 372.

1926. *C. atropos* Kröber, Stett. Ent. Ztg., LXXXVII, 240.

Color. Black, wings infuscated completely to distal margin of crossband.

Size. Length, 8 mm. to 10 mm.

Structural and Color Characters. Female: Vertex, frons, sides of genae yellow pollinose; ocellar area, frontal callus, frontoclypeus, genae, palpi, and antennae fuscous to black. Thorax and abdomen black with sparse whitish pubescence; pleurae with black pile. Halteres black. Wings as figured, cells Cu₁, 1st A, and the anal angle more dilutely infuscated. Legs black; middle and hind metatarsi yellowish. Male: This sex has never been reported.

Comparative Notes. Easily distinguished from any other species lacking the apical spot of the wing by the wing picture.

Remarks. Ricardo (1901) has established the synonymy of *C. divisa* Walker and *C. atropos* O. S., but Kröber (1926) recognizes the synonymy with a doubt.

Type Data. The above description is based on a specimen compared with Walker's type in the British Museum by Major Austen. I have also studied the specimens on which Osten Sacken based his description of *C. atropos*. Nine females remain in the Museum of Comparative Zoölogy, Cambridge, Massachusetts, among them the type of the description.

Distributional Data:

UNITED STATES: New Jersey: 1 specimen (in the U. S. N. M.) collected by Palm, no other data on label. Florida: Plant City, April 26, 1926; Alachua

Co., March 31, 1908, May 18, 1922; Tampa, July 26; Fla., May 5; Orange Co., April 14, 1930; Polk Co., March 3, 1930; Lakeland; Okeechobe Lake; Eagle Lake; Crescent City.

Chrysops dorsovittata Hine (1907)

(Plate XXXIII, fig. 57)

1907. *C. dorsovittatus* Hine, Ohio Nat., VIII, 229.

1926. *C. dorsovittatus* Kröber, Stett. Ent. Ztg., LXXXVII, 325.

Color. Black and yellow, the yellow of the abdominal dorsum with a broad, black, longitudinal stripe.

Size. Length, 6.5 mm. to 7 mm.

Structural and Color Characters. Female: Vertex, frons, sides of genae, a longitudinal stripe on the frontoclypeus, yellow pollinose; ocellar space, frontal callus, frontoclypeus and genae, black. Scape of antenna yellow; pedicel and base of flagellum red-brown; apex of flagellum black. Palpi dark brown. Dorsum of thorax and scutellum fuscous, the former with yellow-gray pollinose stripes; pleurae and venter yellow pollinose with the usual brown stripes. Dorsum of abdomen yellow, the apical three or four segments fuscous, which color extends to the base as a broad median stripe; and on each side as a narrow lateral stripe to the anterior margin of the third segment. Venter of abdomen mostly fuscous, only the first two segments and the sides of the third, yellow, Halteres brown. Wings as figured. Legs black; the front coxae, base of front and middle tibiae, middle and hind metatarsi yellow. Male: Like the female; cell 2d M at the base and the margins along vein Cu infuscated.

Comparative Notes. A distinct species. Readily recognized by the middorsal abdominal stripe and its small size.

Type Data. Described from one female from Georgia and a male from Florida. I have studied both in the Hine collection at the Ohio State Museum.

Distributional Data:

UNITED STATES: Maryland: Glenburnie, June 22, 1922. North Carolina: Southern Pines, May, 1909. Georgia; Florida.

Chrysops excitans Walker (1850)

(Plate XXX, fig. 21)

1850. *C. excitans* Walker, Dipt. Saund., I, 72.

1875. *C. excitans* Osten Sacken, Prodrôme, I, 373.

1887. *C. excitans* Williston, Trans. Kans. Acad. Sci., X, 132.

1902. *C. excitans* Howard, Ins. Book, pl. XVI, f. 16.

1904. *C. excitans* Hine, Ohio Nat., V, 222.

1907. *C. excitans* Daecke, Ent. News, XVIII, 139.

1926. *C. excitans* Cameron, Bull. Ent. Res., XVII, 19, fig. (larva and pupa).

1926. *C. excitans* Kröber, Stett. Ent. Ztg., LXXXVII, 250.

1931. *C. excitans* Philip, Minn. Tech. Bull., LXXX, 85.

The following also refers to this species:

1905. *C. sordidus* Washburn, 10th Rept. State Ent. Minn., p. 79.

Color. Black, with a large, yellow spot on each side of the abdominal dorsum near the base. Abdominal triangles conspicuous or obsolete.

Size. Length, 7 mm. to 12 mm.

Structural and Color Characters. Female: Vertex, frons, sides of genae, and a broad longitudinal median stripe on the frontoelypeus, yellow pollinose. Frontal callus, ocellar area, frontoelypeus, and genae black. Scape of antenna yellow; pedicel and base of flagellum reddish brown to yellow; apex of flagellum black. Palpi black. Dorsum of thorax and scutellum black with dense yellowish pubescence, the former with faint grayish pruinose stripes; pleurae and venter gray-yellow pruinose, the former with heavy yellow pile. Dorsum of abdomen black with a yellow lateral spot on each side near the base. The extent of this spot is quite variable; sometimes ending at the hind margin of the second segment and in some large specimens extending beyond the hind margin of the third segment. A middorsal yellow triangle often occurs on the second segment, sometimes on the third and a trace on the fourth; in small specimens there is scarcely a trace of these triangles. Venter of abdomen mostly black, sometimes yellow at the base. Halteres brown. Wings as figured, the crossband and infuscation in cells R and 2d M subject to variation. Legs black; the extreme apices of the front and middle tibiae, the middle and hind metatarsi, yellow. Male: According to Osten Sacken (1875) this sex is entirely black. The thorax with black and some yellowish pubescence intermixed. The black abdomen with some yellow pubescence and a faint gray middorsal triangle on segment II. Infuscation of wings of greater extent in cells R and 2d M. Cell 1st A and the anal angle lightly infuscated.

Comparative Notes. See under description of *C. noctifera* O. S. Separated from *C. sordida* O. S. by the absence of gray hind margins of the abdominal segments.

Remarks. The extreme variation with this species makes description difficult and not seeing large series would tend to make one dubious as to properly placing specimens. Fortunately, I have a series of more than one hundred females from northern Michigan

which exhibit all the variations in size and pattern that I have mentioned. Also, see Philip (1931).

Type Data. In two females which were compared with Walker's types in the British Museum by Major Austen, the yellow lateral spot on the dorsum of the abdomen does not extend beyond the posterior margin of the second segment; the middorsal triangles are obsolete.

Distributional Data:

CANADA: Newfoundland 3, July 20 - Aug. 8; Labrador 1, July 12; Ontario 1; Northwest Territory 1, July 15; British Columbia 2, June 11.

UNITED STATES: Maine 5, June - Aug.; Massachusetts 1, May 31; New Hampshire 2; New York 1, July 26; New Jersey 1, May 27; Michigan 6, June 18 - July 14; Wisconsin 2, June 4-22; Minnesota 2, June 15; Colorado; Montana; Washington 1, July 7-30; Oregon 2.

In addition, reported by others from:

CANADA: Quebec, Manitoba.

UNITED STATES: Illinois.

Chrysops facialis Townsend (1897)

(Plate XXXIV, fig. 66; Plate XXXV, fig. 92)

1897. *C. facialis* Townsend, Psyche, VIII, 39.

1904. *C. facialis* Hine, Ohio Nat., V, 223.

1926. *C. facialis* Kröber, Stett. Ent. Ztg., LXXXVII, 261.

Color. Black and yellow, the dorsum of the abdomen with some black more or less geminate figures.

Size. Length, 8 mm.

Structural and Color Characters. Female: Vertex, frons, a narrow stripe on the frontoclypeus, and sides of genae, yellow pollinose. Ocellar area, a line leading from it to the frontal callus, this latter, oral margins of genae, a row of four spots across the frontoclypeus, fuscous to black; remainder of frontoclypeus and palpi reddish to brown. Scape of antenna swollen, the outer surfaces black, inner surfaces yellow; pedicel not so swollen, may be colored like the scape or concolorous with the reddish base of the flagellum; apex of flagellum black; both scape and pedicel with black hairs. Dorsum of thorax and scutellum black, the former with faint gray-yellow stripes; pleurae and venter yellow pollinose with brown stripes, the former with dense yellow pile. Dorsum of abdomen yellow with a black quadrate emarginate spot beneath the scutellum; second and third segments each with a pair of triangular black spots on the disc whose bases are united at the anterior margins of the segment; fourth and fifth segments with a more or less double geminate black spot; remaining segments mostly black; all segments with narrow

yellow hind margins. Venter of abdomen yellow with a median row of large quadrate black spots which, toward the apex, extend the full width of the segments; each side with a black stripe, between this and the median row of spots is a dotted black line; all segments with narrow yellow hind margins. Halteres yellow. Wings as figured. Legs yellow; the joints, apices of front tibiae and entire tarsi, apical four segments of the middle and hind tarsi, black. Male: According to Hine (1904): "Colored like the female except more black on legs and wings. In the latter the apical triangle is the same in both sexes, but in each basal cell there is only a small hyaline spot, and the hyaline in the anal cell is much reduced."

Comparative Notes. Separated from others of the group with incrassate antennae by the black frontal callus and four black spots across the frontoclypeus. See remarks.

Remarks. I have seen but two females. The advisability of using the black frontal callus as a character is questionable. In one specimen from Arizona the frontal callus is yellow bordered with black, but conforms in all other respects to the description.

Type Data. Described from one female, West Fork, New Mexico, July 19. In the British Museum. My identification is based on a homotype in the United States National Museum.

Distributional Data:

UNITED STATES: Arizona: Coconino Co., July 1, 1929; Oak Creek Canyon, July.

MEXICO: Chihuahua: Sierra Madre.

In addition, reported by others from:

UNITED STATES: New Mexico.

Chrysops flavida Wiedemann (1821)

(Plate XXXIV, fig. 69; Plate XXXV, fig. 80)

- 1821. *C. flavidus* Wiedemann, Dipt. Exot., I, 105.
- 1828. *C. flavidus* Wiedemann, Auss. Zw., I, 199.
- 1875. *C. flavidus* Osten Sacken, Prodrôme, I, 385.
- 1901. *C. flavidus* Ricardo, Ann. and Mag. N. H., ser. 7, VIII, 300.
- 1901. *C. flavidus* Hine, Ohio Nat., II, 168.
- 1903. *C. flavidus* Hine, Ohio St. Acad. Sci. Spec. Pap. No. 5, p. 37.
- 1906. *C. flavidus* Daecke, Ent. News, XVII, 41.
- 1907. *C. flavidus* Daecke, Ent. News, XVIII, 146.
- 1907. *C. flavidus* Hine, Bull. 93, La. Exp. Sta., 29.
- 1925. *C. flavidus* Hine, Occ. Pap. Mus. Zool. U. of Mich., 1762, p. 19.
- 1926. *C. flavidus* Kröber, Konowia, IV, 329.
- 1926. *C. flavidus* Kröber, Stett. Ent. Ztg., LXXXVII, 291.
- 1930. *C. flavidus* Schwardt and Hall, Bull. 256, Ark. Exp. Sta., 14.
- 1931. *C. flavidus* Schwardt, Jl. Kans. Ent. Soc., IV, 7, larva.

The following also refer to this species:

- 1848. *C. canifrons* Walker, List, I, 197.
- 1859. *C. pallidus* Bellardi, Saggio, I, 73, pl. II, f. 16.

Color. Yellow, with brown abdominal pattern.

Size. Length, 7 mm. to 10 mm.

Structural and Color Characters. Female: Variable. Frontal callus, frontoclypeus, genae, and palpi yellow, the usual areas including the ocellar space with yellow pollen. Antennae slightly swollen or not; the scape, pedicel and base of flagellum yellow to brown-yellow, the first two with black pubescence; apex of flagellum black. Thoracic dorsum, pleurae and venter yellow or gray-yellow pollinose with the usual brown stripes; scutellum yellow to brown, or sometimes yellow with a brown spot at the base. Dorsum of abdomen yellow, the second segment with a more or less inverted V-shaped brown figure at the posterior margin; remaining segments with emarginate brown bands which become nearly plain near the apex; posterior margins of the segments caudad from III, yellow. Venter of abdomen yellow at base; anterior margins of apical segments brown, which color may or may not appear in the form of quadrate median spots on segments III, IV, and V; usually traces of brown lateral streaks. Halteres brown. Wings typically as figured, although the extent of infuscation, especially of the apical spot and anal area shows considerable variation. Sometimes the apical spot fades gradually toward the posterior margin of the wing and the crossband fades into the anal area and toward the base of the wing. Daecke (1907) has shown some of these variations. In some specimens the wing picture is nearly similar to that figured for *C. brunnea* Hine. Legs yellow; the joints and distal half of the tibiae and entire tarsi of the front legs, the four distal tarsal segments of the middle and hind legs, brown. Sometimes the hind femora and tibiae are more brown than yellow. Male: Like the female except for sex characters, more densely pilose.

Comparative Notes. See under description of *C. brunnea* Hine. I have some specimens from Florida which superficially resemble *C. pudica* O. S., but the greater extent of the apical spot into cell R_4 , the absence of a black spot under the scutellum and the yellow hind femora easily identified them. The male may be confused with the male of *C. cursim* Whit. The wing picture and color of the thoracic dorsum and scutellum will aid in separation.

Remarks. Because of the variation within this species I have taken it out in two places in the key to females. Whether or not the antennae of *C. flavida* are swollen is perhaps a matter of opinion. In most cases the antennae are midway between what is generally considered as distinctly incrassate (*C. pachycera* Will.) and slender (*C. vittata* Wied.).

Type Data. Described from the female from Savannah. In the Museum of Vienna.

Distributional Data:

UNITED STATES: Massachusetts 2, July 15-Aug. 20; Connecticut 1, June 23-24; New York 1, June 30; New Jersey 1, June 20-July 19; Delaware 2, July 11-18; Maryland 5, June 16-Aug. 28; Virginia 4, June 7-Sept. 8; North Carolina 1, June 10; South Carolina 2, June 7-Sept. 2; Georgia 1, Aug. 22; Florida 18, Feb. 25-Nov. 28; Indiana 1, July 23; Alabama 1, Aug.; Illinois 1, May 25-June 28; Arkansas 3, June 4-Sept. 15; Louisiana 7, June 16-Oct. 1; Kansas 1, July 22; Texas 6, March 11-July 30.

BAHAMA ISLANDS: New Providence, June 30.

CUBA: Havana, June.

In addition, reported by others from:

UNITED STATES: Maine, New Hampshire, Rhode Island, Pennsylvania, Ohio.
MEXICO.

Chrysops frigida Osten Sacken (1875)

(Plate XXXIII, fig. 62)

1875. *C. frigidus* Osten Sacken, Prodrone, I, 384.

1876. *C. frigidus* Osten Sacken, Prodrone, II, 474.

1903. *C. frigidus* Hine, O. State Acad. Sci. Spec. Pap. No. 5, p. 37.

1904. *C. frigidus* Hine, Ohio Nat., V, 223.

1907. *C. frigidus* Daecke, Ent. News, XVIII, 145.

1926. *C. frigidus* Cameron, Bull. Ent. Res., XVII, 20 (larva and pupa), fig.

1926. *C. frigidus* Kröber, Stett. Ent. Ztg., LXXXVII, 330.

1931. *C. frigidus* Philip, Minn. Tech. Bull. LXXX, 86.

The following also refers to this species:

1926. *C. canadensis* Kröber, Stett. Ent. Ztg., LXXXVII, 277.

Color. Black and golden-yellow, extent of both colors extremely variable on both abdomen and legs.

Size. Length, 6.5 mm. to 8 mm.

Structural and Color Characters. Female: Ocellar area, frontal callus, frontoclypeus and oral margins of genae, black; vertex, frons, a streak down the center of the frontoclypeus, sides of genae, yellow pollinose. Antennae with a variable amount of black and yellow on the scape and pedicel, the black usually dominant on the latter; base of flagellum sometimes reddish or yellow, usually the entire flagellum is black. Palpi yellow to yellow brown. Dorsum of thorax and scutellum shining black with some yellowish pruinosity which on the former takes the form of more or less faint stripes; pleurae and venter gray-yellow pruinose with black stripes, the former with bright-yellow pile. Dorsum of abdomen yellow with a black quadrate or trapezoidal spot beneath the scutellum which practically attains the hind margin of the first segment; here it merges with a broader than long, black, more or less pentagonal spot on the second segment emarginate posteriorly. In some specimens

the black spot on segment II is rectangular and confined to the anterior margin; however, it is practically always emarginate. Remaining segments predominantly black with yellow hind margins tending to expand into middorsal triangles. Venter of abdomen yellow at the base, the apical segments black with yellow posterior margins; sometimes a black spot is present on the disc of the first two or three basal segments. Halteres yellowish to black. Wings as figured. Legs variable, in some forms predominantly yellow, in others black. In the former, the front coxae, extreme bases and apices of all femora, distal tarsal segments, dark; in the latter, the base of the front tibiae, most of the middle and hind tibiae and metatarsi, yellow. Male: Head as in the female except for sex characters. Thorax more densely yellow pubescent and pilose. Dorsum of abdomen yellow with a median broad black trapezoidal spot on each of the first four segments; remaining segments mostly black; all segments with narrow yellow hind margins. In some specimens the abdominal pattern is much like the female, except the black spots instead of being emarginate posteriorly are more or less produced. Venter of abdomen exhibiting variations as in the female, in one specimen almost entirely black, except for the narrow yellow hind margins of the segments and traces of yellow at the sides near the base. Halteres yellowish to black. Wings with a greater extent of infuscation of cells R and 2d M and in the anal area. Legs variable, usually with more black than in the female.

Comparative Notes. The peculiar abdominal pattern should easily separate this species from others with an apical spot on the wing and black frontoclypeus with a mid-streak of yellow pollen, namely *C. pertinax* Will., *C. amazon* Daecke and *C. noctifera* O. S. In the first two the abdomen is wholly black; in the last, the apical spot includes only the extreme apex of cell R_4 , the apex of the hyaline triangle extends beyond vein R_{2+3} , and the yellow of the abdomen is confined to the sides near the base. *C. frigida* is probably close to *C. pilumna* Kröber (assuming this latter to be a distinct species and not an aberrant or teneral *C. frigida*). In Kröber's species the frontoclypeus is yellow, lacking a pollinose midstreak, and the first abdominal tergite is almost completely black. The legs are predominantly yellow.

Remarks. I have had a male specimen of *C. frigida* compared with Kröber's type of *C. canadensis*; except for slight variations, they are identical. Doctor Walley, of the Canadian National Museum, who made the comparisons, states that Kröber's specimen

seems slightly teneral, and also adds as follows: "General dorsal abdominal pattern . . . First tergite with median blackish portion a little broader than in your specimen, thus posterolateral paler portions slightly reduced. Second tergite with blackish portion a little broader than your specimen and continued (though slightly less heavily blackish) to apex of tergite, remaining tergites maculate as in your specimen except that blackish bands are more transverse with less tendency to be produced posteriorly in the middle. Frontoclypeus, face, and cheeks agree in color with your specimen. Facets of eyes . . . of two sizes as in your specimen."

Type Data. I have studied the types (five females and "two hypothetical males") in the Museum of Comparative Zoölogy, Cambridge, Massachusetts. Habitat, according to Osten Sacken (1875): Great Slave Lake and Northwestern Regions of the British Possessions; Saskatchewan; Quebec; New York; Massachusetts.

Distributional Data:

CANADA: New Brunswick 1, July 14; Quebec 1, June 16; Manitoba 1, July 16; British Columbia 1, July 18.

UNITED STATES: Maine 1, July 11; New Hampshire 1; Massachusetts 6, June 12 - July; New York 4, June 19 - July 10; Michigan 3, July 1-25; Ohio 1, June 8; Colorado 1, July 22; Washington 1, July 25.

In addition, reported by others from:

CANADA: Newfoundland, Ontario, Saskatchewan.

UNITED STATES: Connecticut, New Jersey, Minnesota, Wisconsin.

Chrysops fuliginosa Wiedemann (1821)

(Plate XXXIII, fig. 60)

1821. *C. fuliginosus* Wiedemann, Dipt. Exot., I, 109.

1926. *C. fuliginosus* Kröber, Stett. Ent. Ztg., LXXXVII, 311.

The following also refer to this species:

1828. *C. plangens* Wiedemann, Auss. Zw., I, 210.

1875. *C. plangens* Osten Sacken, Prodrôme, I, 393.

1906. *C. plangens* Daecke, Ent. News, XVII, 42.

1907. *C. plangens* Daecke, Ent. News, XVIII, 141.

Color. Gray-black or brown; infuscation of wings not very saturate, usually a distinct spot at the bifurcation of vein R_{4+5} .

Size. Length, 6 mm. to 7.5 mm.

Structural and Color Characters. Female: Vertex, frons, and sides of genae yellow pollinose; ocellar space, frontal callus sides of frontoclypeus, oral margins of genae, and palpi, fuscous; frontoclypeus and basal segments of antennae yellow to brown-yellow; apical segments of flagellum black; sometimes the scape and pedicel considerably darkened. Dorsum of thorax and scutellum fuscous

with yellowish pubescence, the former with obscure grayish to gray-yellow pollinose stripes; pleurae and venter grayish pollinose with brown stripes, the former with more or less fulvous pile. Dorsum of abdomen gray-brown, all segments with narrow yellowish hind margins; the dark color on the discs of the first three or four segments more pronounced and forming obscure but definite geminate spots. Venter of abdomen gray-brown with very narrow yellowish hind margins to the segments. Halteres brown. Wings as figured; a faint tooth-like projection from the crossband to the bifurcation of vein R_{4+5} present or absent. Legs brown; the extreme base of the front tibiae, most of the median tibiae, sometimes the basal portion of the hind tibiae, the median and hind metatarsi, yellow. Male: Darker than the female. Antennae fuscous. Pile of the pleurae black. Abdomen fuscous. The wings more extensively infuscated; the apex of the hyaline triangle beyond vein R_{4+5} represented by a mere hyaline streak; a small hyaline dot near the apices of cells R and 2d M. Legs much like the female but with a little more brown.

Comparative Notes. Separated from *C. brimleyi* Hine by the greater extent of the apical spot of the wings, and the infuscated spot at the bifurcation of vein R_{4+5} .

Type Data. Described from a male, "Aus Nordamerika," In the Museum of Vienna. A female described as *C. plangens*, Savannah, Georgia, presumably in the University of Berlin. Kröber (1926) in his description of *C. fuliginosa* states that a female from Savannah designated as the type is in the University of Berlin, but does not say whether it is labeled *C. fuliginosa* or *C. plangens*.

Distributional Data:

UNITED STATES: Massachusetts 3, June 13-25; Rhode Island 1, June; Connecticut; New York 3, June 5-29; New Jersey 2, May 28 - June 11; Delaware 1, May 26; Virginia 1, May 14; North Carolina; South Carolina 2, May 28; Georgia 2; Florida 4, March 16 - April 17.

CANADA: Nova Scotia.

UNITED STATES: Maine.

Chrysops fulvastra Osten Sacken (1877)

(Plate XXXIV, fig. 70; Plate XXXV, fig. 90)

- 1877. *C. fulvaster* Osten Sacken, West. Dipt., p. 221.
- 1887. *C. fulvaster* Williston, Trans. Kans. Acad. Sci., X, 134.
- 1904. *C. fulvaster* Hine, Ohio Nat., V, 223.
- 1924. *C. fulvaster* Wehr, Neb. Univ. Studies, XXII, 112.
- 1926. *C. fulvaster* Cameron, Bull. Ent. Res., XVII, 21 (larva and pupa), fig.
- 1931. *C. fulvaster* Philip, Minn. Tech. Bull., LXXX, 86.
- 1926. *Heterochrysops fulvaster* Kröber, Stett. Ent. Ztg., LXXXVII, 233.
- 1928. *H. fulvaster* Kröber, Deutsche Ent. Ztsch., p. 427.

The following also refers to this species:

1892. *C. coloradensis* Bigot, Mem. Soc. Zool. France, V, 605, (partim).

Color. Female: Fuscous or brown with gray-yellow abdominal triangles; wing picture fenestrate. Male: mostly black or fuscous, abdominal triangles much reduced; wings much more infuscated.

Size. Length, 6 mm. to 8 mm.

Structural and Color Characters. Female: Vertex, frons, sides of genae and a mid-streak on the frontoclypeus yellow pollinose; upper margin of frontal callus, a small spot on each side of the frontoclypeus, another on the oral margin of the genae, fuscous; disc of frontal callus, remainder of frontoclypeus and genae, and the palpi, yellow. Antennae decidedly incrassate, the scape most strongly; flagellum scarcely longer than the scape; the scape, pedicel, and base of flagellum brown-yellow to brown, sometimes the outer surfaces of the first two, and always the apex of the flagellum, black. Dorsum of thorax and scutellum brown or yellow-brown pruinose, the former with fuscous stripes; pleurae and venter gray-yellow pollinose with the usual brown stripes. Dorsum of abdomen yellowish or gray-yellow with a black spot beneath the scutellum; second segment with a median pair of oblique black spots, sometimes nearly united at the anterior margin to form a geminate spot; remaining segments black with yellowish posterolateral angles and hind margins which expand to form middorsal triangles. Venter of abdomen gray-yellow, each segment with a large fuscous quadrate median spot which apically occupies nearly the whole width of a segment; hind margins of all segments gray-yellow; fuscous lateral stripes usually present. Halteres yellow. Wings as figured. Legs orange-yellow; the joints, front tarsi, and apical three or four segments of the middle and hind tarsi, fuscous. Male: Predominantly black. Antennae and palpi black. Thorax similar to female but with a greater extent of black. Dorsum of abdomen black; all segments with yellowish posterolateral angles and narrow hind margins which expand into very small middorsal triangles. Wings with all cells included by the picture more extensively infuscated than in the female, but the general pattern is the same, and should cause no difficulty in associating the two sexes. Legs practically like the female, except the front legs which are wholly black except the base of the tibiae, and the hind femora sometimes are black at the base.

Comparative Notes. This species is distinct and should not be easily confused with others of the group with swollen antennae. From *C. discalis* Will. it may at once be separated by the antennae; from *C. coquilletti* Hine, and *C. clavicornis* n. sp. by the fenestrate discal cell and abdominal pattern; from *C. latifrons* n. sp. by the abdominal pattern and absence of a tooth-like projection of the crossband, as well as a greater extent of the apical spot.

Type Data. Described from five females and one male from Colorado and Utah. I have studied these types at the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

UNITED STATES: North Dakota 1, June 30 - July; South Dakota 6, June 15 - July 16; Nebraska 1, May; Kansas 4, June - July 26; Oklahoma 1, July 19; Montana 2, July 14-16; Wyoming 5, June 22 - Aug. 12; Colorado 18, June 4 - Aug. 14; New Mexico 4, June 22 - July 29; Idaho 2, July 6-25; Utah 12, June 18 - Aug. 14; Arizona 3, July 2 - Aug. 15; California 1.

In addition, reported by others from:

CANADA: Saskatchewan, Alberta.

UNITED STATES: Minnesota.

Chrysops fulvistigma Hine (1904)

(Plate XXX, fig. 13)

1904. *C. fulvistigma* Hine, Can. Ent., XXXVI, 55.

1907. *C. fulvistigma* Daecke, Ent. News, XVIII, 146.

1907. *C. fulvistigma* Hine, Bull. 93, La. Exp. Sta., p. 29.

1926. *C. fulvistigma* Kröber, Stett. Ent. Ztg., LXXXVII, 248.

Color. Black and yellow, the latter color predominant on the two basal abdominal segments. Wing picture extremely dilute, so that the wings appear to be almost hyaline with a prominent yellowish stigma and yellow veins.

Size. Length, 6.5 mm. to 7 mm.

Structural and Color Characters. Female: Vertex, frons, sides of genae, a few streaks on the frontoclypeus, yellow pollinose; frontal callus, frontoclypeus and oral margins of the genae, black. Palpi and scape of antenna yellow; pedicel and first segment of flagellum yellow-brown; apical four segments of flagellum black. Dorsum of thorax and scutellum fuscous with grayish pruinosity, the former faintly striped; pleurae and venter yellow pollinose with brown stripes. Dorsum of abdomen black and yellow as follows: First segment yellow with a quadrate emarginate black spot beneath the scutellum, attaining the posterior margin; second segment yellow with a black posterior margin which on the disc sends out two finger-like processes which almost reach the anterior margin

(in one specimen the median figure on segment II is solid black); third segment black with a small yellow median spot at the anterior margin and on each side a smaller yellow spot; remaining segments black. Venter of abdomen with the first two segments yellow; the third yellow with a large quadrate black spot on the disc; remaining segments black. Halteres brown. Wings as figured. Legs brown; front coxae, base of femora and tibiae, apex of middle femora, entire tibiae and metatarsi, base of hind tibiae and metatarsi, yellow. Male: Like the female in all respects except for sex characters; very easily associated.

Comparative Notes. The unusual abdominal pattern and the wings will easily distinguish this species from all others included in this paper.

Remarks. This is the first time that the male has been reported.

Type Data. I have studied the types in the Hine collection at the Ohio State Museum. Described from two females taken at Raleigh, North Carolina, July 15 and 17, 1902.

Distributional Data:

UNITED STATES: North Carolina: Raleigh, June 11, 1906; June 17, 1907. Georgia: Decatur Co., June 7-23, 1911. Louisiana: Osborn, July 19, 1906.

In addition, reported by others from:

UNITED STATES: New Jersey.

Chrysops furcata Walker (1848)

(Plate XXXI, fig. 37; Plate XXXVII, fig. 114)

1848. *C. furcatus* Walker, List, I, 199.

1904. *C. furcatus* Ricardo, Ann. and Mag. N. H., ser. 7, VIII, 302.

The following also refer to this species:

1904. *C. lupus* Whitney, Can. Ent., XXXVI, 205.

1904. *C. lupus* Hine, Ohio Nat., V, 224.

1926. *C. lupus* Kröber, Stett. Ent. Ztg., LXXXVII, 304.

1931. *C. lupus* Philip, Minn. Tech. Bull., LXXX, 88.

Color. Black and yellow.

Size. Length, 9 mm. to 10 mm.

Structural and Color Characters. Female: Vertex gray to gray-yellow pollinose; frons and sides of genae yellow pollinose; ocellar area, frontal callus, a spot on each side of the frontoelypeus, oral margin of genae, black; frontoelypeus and palpi yellow, the latter with a little black on the outer surfaces; antennae black; the basal portion of the scape and sometimes the inner surface of the pedicel, yellow. Thoracic dorsum and scutellum fuscous, yellowish pubes-

cent, the former with gray-pollinose stripes; pleurae and venter yellowish pollinose with the usual fuscous stripes, the former with heavy yellow pile. Dorsum of abdomen yellow; a quadrate black spot beneath the scutellum, barely emarginate posteriorly, practically attaining a pentagonal geminate spot on the disc of the second segment; segments III, IV and V each with four black more or less triangular spots whose bases rest on the anterior margin where they tend to be united; remaining segments black with yellow hind margins. Venter of abdomen yellow; first segment with a black spot on the disc which usually continues on to the second segment; second segment with a small black spot on the disc; segments III, IV and V each with a median black quadrate spot; remaining segments black with yellow hind margins; the usual black lateral streaks present. Halteres brown. Wings as figured; the apex of the hyaline triangle distinctly exceeding vein R_{2+3} ; the extent of infuscation in cells R and 2d M variable. Legs black and yellow, the former distributed as follows: the joints, front femora, tibiae and tarsi, except the extreme base of the tibiae and the inner surfaces of the femora, bases of middle and hind femora, apical portions of hind tibiae, and middle and hind tarsi. Sometimes the yellow is more prevalent, especially on the basal portions the front femora and tibiae and the apical portion of the hind tibiae. Male: Philip (1931) reports one male from Montana, but does not describe it. I have not seen this sex.

Comparative Notes. This species is related to *C. coloradensis* Bigot and *C. montana* O. S. From the former it is readily separated by the different abdominal pattern, the black frontal callus and the black on each side of the frontoclypeus and on the oral margin of the genae; from the latter, by the greater extent of the hyaline triangle on the wing and the apical spot occupying only the apex of cell R_4 , and again by the black on each side of the frontoclypeus and on the oral margin of the genae. *C. furcata* is very apt to be confused with *C. proclivis* O. S., but this latter has cell R of the wings completely infuscated and on the second abdominal tergite a small black spot on each side of the median geminate spot.

Remarks. The synonymy is based on a homotype in Hine's collection and Walker's description. The *C. furcatus* of Hine (1904), Kröber (1926) and in the key of Philip (1931) is a large form of *C. montana* O. S. which may deserve varietal rank. I have seen Hine's series. I fail to see how these authors were justified in referring to the facial callosities and cheeks as yellow, for Walker (1848)

states: "Head yellow, slightly hoary behind, with two piceous tubercles above, ferruginous and shining in front between the feelers and the mouth, where there are also two piceous shining spots on each side"

Type Data. In the British Museum. Described from specimens from St. Martin's Falls, Albany River and Hudson Bay. Whitney's types of *C. lupus* are in very poor condition. In the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

CANADA: New Brunswick 1, July 27; Manitoba 2, July 9-21; Alberta 2, May 7 - July 22; British Columbia 3, June 12 - July 15.

UNITED STATES: South Dakota 1, July 19; Montana 5, June 23 - Aug. 14; Wyoming 3, June 27 - Aug. 18; Oregon 2, July 10-20; California 1, May 15-19; Alaska 2, July 4.

In addition, reported by others from:

UNITED STATES: Michigan, Minnesota.

Chrysops geminata Wiedemann (1928)

(Plate XXXII, fig. 45)

1828. *C. geminatus* Wiedemann. Auss. Zw., I, 205.

1926. *C. geminatus* Kröber, Stett. Ent. Ztg., LXXXVII, 299 (syn.).

The following also refer to this species:

1875. *C. fallax* Osten Sacken, Prodrôme, I, 392.

1903. *C. fallax* Hine, Ohio State Acad. Sci. Spec. Pap. No. 5, p. 36.

1906. *C. fallax* Daecke, Ent. News, XVII, 40, 41.

1907. *C. fallax* Daecke, Ent. News, XVIII, 141.

1918. *C. fallax* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 197.

Color. Yellow with black abdominal pattern.

Size. Length, 6.5 mm. to 7.5 mm.

Structural and Color Characters. Female: Frontal callus, ocellar area, the pit on each side of the frontoclypeus, and spot on the oral margin of the genae, black; frontoclypeus, genae, and palpi, yellow; the usual areas yellow pollinose. Scape of antenna yellow; pedicel and base of flagellum yellow-brown; apex of flagellum black. Dorsum of thorax, pleurae and venter gray-yellow to yellow pruinose; the usual stripes and the scutellum fuscous. Dorsum of abdomen yellow with a black spot beneath the scutellum; the second segment with a pair of small black oblique spots on the disc, not reaching either margin; segments III, IV and V mostly black with yellow hind margins and a median yellow stripe; remaining segments black with yellow hind margins. Sometimes the black on each side of the yellow median stripe of segments III, IV and V is again partly cut

by yellow, so that these segments are yellow with four black spots. Venter of abdomen yellow at the base with a quadrate black median spot on segments III and IV. The apical segments black with yellow hind margins; the usual black lateral streaks present. Halteres brown. Wings as figured. Legs black; the front coxae and basal two thirds of femora and base of tibiae, apical half of middle femora and entire tibiae and metatarsi, base of hind tibiae, and metatarsi, yellow. Male: Similar to the female except for sex characters and a bit more infuscation at the apices of cells R and 2d M. Sometimes the median spots on the second abdominal tergite are practically united anteriorly.

Comparative Notes. Related to *C. lateralis* Wied., from which it may be separated by the apical spot occupying most of cell R₄, the crossband attaining the hind margin of the wing, and the black spots of the second abdominal tergite not reaching the hind margin. In addition, *C. lateralis* is a generally larger species.

Remarks. With respect to the synonymy of *C. geminata* Wied. and *C. fallax* O. S. I prefer to follow Kröber, who has studied Wiedemann's type and compared it with "eine sec-Type" of *C. fallax*. A question of doubt exists, however, inasmuch as Wiedemann gives as the type locality, "Vaterland?" and Kröber states the type to be "stark verschmiert."

Type Data. One female in the Museum of Vienna. I have seen Osten Sacken's types of *C. fallax* at the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

UNITED STATES: Massachusetts 5, July 4-25; Connecticut; New York 3, July 1 - Aug. 1; New Jersey 5, June - July 7; Pennsylvania 3, June 26 - July 15; Maryland 3, June 18 - July 9; Virginia 1; South Carolina 1, June; Ohio 5, June 7 - Aug. 1; Tennessee 1, Aug. 3; Illinois 1.

In addition, reported by others from:

CANADA: Quebec, Ontario.

UNITED STATES: New Hampshire, Vermont, Delaware, North Carolina, Georgia.

Chrysops geminata impuncta Kröber (1926)

1926. *C. geminatus* Wied. var. *impunctus* Kröber, Stett. Ent. Ztg., LXXXVII, 301.

Color. Yellow with black abdominal pattern.

Size. Length, 6.5 mm. to 7 mm.

Structural and Color Characters. Female: Similar to *C. geminata* Wied. except for the total absence of black on the first and second abdominal segments. Legs yellow; apical portion of front tibiae

and entire tarsi, distal four segments of the middle and hind tarsi, base of hind femora and apex of tibiae, fuscous. Wings as figured for *C. geminata*. Male: Like the female except for sex characters.

Comparative Notes. Separated from *C. geminata* Wied. by the absence of the black spots on the second abdominal tergite. Doctor Walley of the Canadian National Museum compared one of my specimens with Kröber's type concerning which he states: "Size: very slightly larger than your specimen. Length, 6.5 mm. Abdominal pattern . . . First and second tergites identical with your specimen except that first tergite has only a very faint trace of brownish at middle of anterior margin. Third tergite with a small median pale triangle, the apex of which scarcely attains the posterior margin. Fourth tergite with narrow, obscure median stripe. Fifth tergite without pale median stripe."

Type Data. Type No. 1341, Canadian National Collection, Ottawa.

Distributional Data:

UNITED STATES: Maryland: Catonsville, June 30, 1922. Ohio: Medina Co., July 19, 1903, Aug. 1, 1901; Ira.

In addition, reported by others from:

CANADA: Ontario: Port Stanley; Ottawa; Guelph.

Chrysops hinei Daecke (1907)

(Plate XXXIII, fig. 55)

1907. *C. hinei* Daecke, Ent. News, XVIII, 143.

1926. *C. hinei* Kröber, Stett. Ent. Ztg., LXXXVII, 338.

Color. Yellow with black longitudinal stripes.

Size. Length, 7 mm. to 8.5 mm.

Structural and Color Characters. Female: Vertex gray-yellow pollinose, frons and sides of genae yellow pollinose; frontal callus yellow, margined above with brown; frontoclypeus, genae, palpi, and scape of antenna yellow; pedicel and base of flagellum yellow-brown, the apex of the latter fuscous to black. Dorsum of thorax and scutellum brown, the former with grayish stripes, the latter sometimes yellow at the tip; pleurae and venter yellow pollinose with brown stripes. Dorsum of abdomen yellow with four longitudinal black stripes, the lateral ones broken or incomplete, extending toward the base rarely beyond the posterior margin of the second segment; the last two segments almost entirely black. Venter of abdomen yellow with a broad, black median stripe, not attaining the base; two black lateral streaks present; apical seg-

ments mostly black. Halteres brown. Wings as figured, the long narrow hyaline triangle characteristic. Legs yellow; apical portion of front tibiae and entire tarsi, base of hind femora and apex of tibiae, apical four segments of middle and hind tarsi, brown. Male: Not identified. Daecke (1907) mentions a hypothetical specimen from Clementon, New Jersey, September 7, 1905, but defers description for want of evidence.

Comparative Notes. To be separated from related species according to the key. The narrow hyaline triangle due to the broad posterior extent of the apical spot along with the yellow frontal callus and incomplete lateral stripes on the abdominal dorsum easily distinguishes this species.

Type Data. Described from seventeen females, all from New Jersey. I have studied the cotypes in the United States National Museum and at the Ohio State Museum.

Distributional Data:

UNITED STATES: New Jersey: Lakehurst, Sept. 4; Weymouth, Aug. 16, 1904. South Carolina: Plantersville, Sept. 20, 1912; Allendale, Sept. 15, 1931. Georgia: Mimsville, Sept. 12, 1907. Florida: Alachua Co., Nov. 18, 1929; Cambon, Sept. 20, 1925.

In addition, reported by others from:

UNITED STATES: Massachusetts, North Carolina.

Chrysops hungerfordi, new species

(Plate XXXVI, fig. 100)

Color. Tawny yellow with black abdominal pattern; wing picture saturate.

Size. Length, 6.5 mm. to 8 mm.

Structural and Color Characters. Female: Vertex broader than long, yellow pollinose; frons, a mid-streak on the frontoclypeus and sides of genae yellow pollinose; frontal callus, frontoclypeus, oral margins of genae, and palpi, yellow; antennae incrassate, the scape prominently swollen, yellow except the black apex of the flagellum, often the upper and outer sides of the scape and pedicel, black. Dorsum of thorax and scutellum yellow-gray pollinose, white pubescent, the former with obscure stripes; pleurae and venter yellow-gray pruinose, sparsely white pilose. Dorsum of abdomen tawny yellow; a black spot beneath the scutellum deeply incised posteriorly, attaining or not, the hind margin of the first segment; second segment with a median black geminate figure or with two black angular spots divergent posteriorly; segments III to VI each with

a median pair of black angular spots whose bases are directed anteriorly, and small black irregular lateral spots; sometimes the black figures on segments III to V are united near the anterior margins or form double geminate spots; seventh segment and sometimes also the sixth mostly black with yellow hind margins. Venter of abdomen yellow or tawny with a black median stripe and usual lateral stripes; the two apical segments almost entirely black except for the yellow hind margins. Halteres yellow. Wings as figured. Legs yellow, the joints, apical portion of front tibiae and entire tarsi, the four apical segments of the middle and hind tarsi, and rarely the extremities of the hind tibiae, black. Male: In addition to sex characters it differs from the female in the dorsal abdominal pattern and the wing picture. Dorsum of abdomen dominantly black, the first segment wholly black except for the narrow yellow posterolateral angles and a minute yellow median spot on the posterior margin; second segment yellow with a heavy black median geminate figure, on each side of which is a small black spot; segments III to V yellow, each with a black double geminate figure whose median paired spots are the larger; remaining segments black with narrow yellow hind margins. The wing picture differs from that of the female primarily in the greater extent of infuscation in cell M which is nearly equal to that of cell R.

Comparative Notes. *C. coquilletti* Hine and *C. pachycera* Will. are the nearest relatives of this species. From *C. coquilletti*, the female of *C. hungerfordi* may be separated by the infuscation in the basal part of cell M which ends rather abruptly, and by the black median figure on the second abdominal tergite, which is smaller and often composed of two spots; the males are easily separated by the dorsal abdominal patterns, no lateral spots on the second segment in *C. coquilletti*, etc., also the infuscation of cell M being nearly equal to that of cell R in *C. hungerfordi* offers further proof of their separateness. The wing picture of *C. hungerfordi* is very similar to that of *C. pachycera* in both sexes; however, the dorsal abdominal patterns are different. In the female of *C. hungerfordi* black lateral spots are always present caudad from segment III, whereas in *C. pachycera* it is the rule that these spots are absent; the males are readily separated by the presence of black lateral spots on segment II in *C. hungerfordi*.

Remarks. The three species considered under "Comparative Notes" have many affinities, each exhibiting more or less variation. Any one may be justly confused with another, especially in the

females. Careful discrimination and judgment is required to separate them. By means of the males, however, separation is greatly facilitated.

Type Data. Holotype, female; Blue Spring, Eddy Co., New Mexico, July 12, 1933, J. M. Brennan. Allotype, male; same data. Paratypes, one male, same data; one male, Eddy Co., New Mexico, July 9, 1927, P. A. Readio; one male, San Bernardino Ranch, Cochise Co., Arizona, August, F. H. Snow; nine females, same data as holotype. In the Francis Huntington Snow Entomological Collection of the University of Kansas.

NOTE. This species is named for Dr. H. B. Hungerford through whose inspiration the author has been stimulated to enter into the field of systematic entomology.

Chrysops hyalina Shannon (1924)

1924. *C. hyalinus* Shannon, Proc. Ent. Soc. Wash., XXVI, 178.

1930. *C. hyalinus* Bequaert, Rept. Harvard-African Exped., etc., p. 890.

The following also refer to this species:

1916. *C. vitripennis* Shannon, Ins. Ins. Menst., IV, 69, (preoc.).

1918. *C. vitripennis* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 198.

1926. *Nemorius claripennis* Kröber, Stett. Ent. Ztg., LXXXVII, 230.

Color. Black, with hyaline wings.

Size. Length, 5.5 mm. to 6 mm.

Structural and Color Characters. Female: Vertex black with sparse whitish pubescence, at the base of the antennae some white pollen; frons and sides of genae whitish pollinose. Frontal callus, frontoclypeus, genae, and palpi, black. Antennae slender, mostly black, except the scape, which is light-brown pollinose. Thorax and abdomen shining black with pale pile and pubescence in the usual regions. Halteres black. Wings hyaline except the yellowish costal area and stigma; veins yellow. Legs black; the middle and hind metatarsi pale. Male: Unknown.

Comparative Notes. This is the only described species in this country without a wing picture, and hence quite distinct. Its nearest relative is *C. nigribimbo* Whit., from which it differs in general color, vertex, frontoclypeus, wings and legs.

Remarks. According to McAtee by Shannon (1926) the habits of *C. hyalina* are quite different from those of *C. nigribimbo*. The former has been taken only in sphagnum bogs; it perches on low vegetation, and flies slowly and feebly but a short distance at a time.

Type Data. Described from four females, all from Beltsville, Maryland. I have studied the type (No. 21301) in the United States National Museum.

Distributional Data. Reported from Beltsville, Maryland. Kröber (1926) adds Southern Pines, North Carolina.

Chrysops inda Osten Sacken (1875)

(Plate XXXII, fig. 49)

1875. *C. indus* Osten Sacken, Prodrôme, I, 383.
1901. *C. indus* Hine, Ohio Nat., II, 168.
1903. *C. indus* Hine, Ohio St. Acad. Sci. Spec. Pap. No. 5, p. 38.
1906. *C. indus* Daceke, Ent. News, XVII, 42.
1907. *C. indus* Daceke, Ent. News, XVIII, 141.
1920. *C. indus* Marchand, Mon. Rock. Inst. No. 13, p. 48.
1926. *C. indus* Kröber, Stett. Ent. Ztg., LXXXVII, 326.
1930. *C. indus* Stone, Ann. Ent. Soc. Am., XXIII, 282.
1931. *C. indus* Philip, Minn. Tech. Bull., LXXX, 87.

Color. Black and yellow, the former dominant in the dorsal abdominal pattern, especially in the male.

Size. Length, 6 mm. to 10 mm.

Structural and Color Characters. Female: Vertex and sides of genae yellow pollinose; frontal callus black; frontoclypeus, genae, and palpi, orange-yellow; antennae rather thick; the scape yellow, pedicel and base of flagellum reddish, apex of the latter black. Often the distal ends of both scape and pedicel are darker than their bases. Dorsum of thorax and scutellum gray pruinose, with yellow pubescence, the former with brown stripes, the latter with the brown ground color distinctly showing through; pleurae and venter gray-yellow pollinose with the usual brown stripes, the former with fulvous pile. The yellow of the abdominal dorsum with a black spot beneath the scutellum, emarginate on the hind margin of the first segment; a black gminate or inverted U-shaped spot on the disc of the second segment, practically attaining both margins; third and fourth segments black with yellow hind margins which expand into long narrow median triangles whose apices are broadly open at the anterior margins; remaining segments black with yellow hind margins. Frequently the yellow of the first two segments continues posteriorly on the sides of segments III and IV. Venter of abdomen mostly yellow, the last three segments black with yellow hind margins; the usual black lateral streaks. Halteres brown. Wings as figured. Legs orange-yellow; all the trochanters, apex of front tibiae and entire tarsi, apical four segments of the middle and hind tarsi, extreme apex of hind femora, black. Male: Much darker than the female. Dorsum of thorax and scutellum mostly black, the former with faint grayish pollinose stripes; pleurae with black pile. Dorsum of abdomen black; the posterolateral angles of the first segment, the sides and a very small posteromedian triangle on

segments II, III and IV, the narrow posterior margins of all segments caudad from III, yellow. Venter of abdomen yellow, the first three segments each with a median broad, black quadrate spot, the remaining segments black with yellow hind margins; the black lateral stripes are quite broad and practically attain the base. Wings like the female, but that cell 2d M is completely infuscated except a small hyaline spot near the apex, and cell 1st A and the anal angle are infuscated, the latter dilutely. Legs yellow; all the joints, basal portions of all femora, apical portion of front tibiae and entire tarsi, apical segments of middle and hind tarsi, black.

Comparative Notes. The abdominal pattern in both sexes of this species is distinct; this along with the wing picture will easily separate *C. inda* from others of its group. It has no close relatives. Osten Sacken (1875) states that it is "very like *C. pudicus*, *montanus*, *hilaris*, . . ."

Type Data. Described from two females from Cayuga Lake, New York and Montreal. In the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

CANADA: Quebec 1, June 20; Ontario 1, June 23.

UNITED STATES: New Hampshire 2, July 5-16; New York 5, June 14-July 29; New Jersey 1, June 18; Delaware 1, June 10; Pennsylvania 3, June 12-July 1; Michigan 2, July 3-Aug. 4; Ohio 9, May 22-July 13; Indiana 1, June; Illinois 4, June 15-July 8; Minnesota 3, June 14-July 6; Colorado 1, July 15-18.

In addition, reported by others from:

UNITED STATES: Vermont, Massachusetts, Connecticut, North Carolina, Wisconsin.

Chrysops lateralis Wiedemann (1828)

(Plate XXXII, fig. 46)

1828. *C. lateralis* Wiedemann, Auss. Zw., I, 209.

1926. *C. lateralis* Kröber, Stett. Ent. Ztg., LXXXVII, 302 (syn.).

The following also refer to this species:

1875. *C. hilaris* Osten Sacken, Prodrôme, I, 391.

1902. *C. hilaris* Howard, Ins. Book, pl. XVI, f. 17.

Color. Yellow, with black abdominal pattern.

Size. Length, 7.5 mm. to 9 mm.

Structural and Color Characters. Female: Vertex gray-yellow pollinose; frons and sides of genae yellow pollinose; frontal callus, a spot on each side of the frontoclypeus, oral margins of genae, black; frontoclypeus, palpi, scape of antenna, yellow; apical portion

of flagellum black. Dorsum of thorax and scutellum brown or plumbeus, the former with the usual grayish pollinose stripes; pleurae and venter yellow pollinose with brown stripes. Dorsum of abdomen yellow with two small black spots beneath the scutellum which do not quite extend to the posterior margin of the first segment; second segment with a median pair of vittate black spots which often attain the posterior margin and sometimes apparently the anterior margin; third and fourth segments each with two more or less quadrate black lateral spots through the center of which the yellow ground color shows; (sometimes these black spots are so completely separated by the yellow ground color that segments III and IV may be said to be yellow with four black spots); remaining segments black with yellow posterior margins, frequently the yellow of segment V incises the black on the disc, but does not attain the anterior margin. Venter of abdomen yellow; segments III, IV and V with a quadrate black median spot; remaining segments black with yellow posterior margins; the usual black lateral streaks extend toward the base not beyond the posterior margin of the second segment. Halteres fuscous. Wings as figured; the apical spot separated from the crossband; the latter not quite attaining the hind margin. Legs yellow; the joints, apical portion of front tibiae and entire tarsi, basal portion of hind femora and sometimes apical portion of hind tibiae, apical four segments of middle and hind tarsi, black. Male: Much like the female except for sex characters. On the dorsum of the abdomen, the pair of black spots beneath the scutellum is larger; a small median black spot is present on each of segments I and II of the abdominal venter. Wings like the female except for a dilute infuscation in the cubital and anal areas. Legs generally exhibiting more black, especially on the hind femora and tibiae, and the apices of the middle and hind metatarsi.

Comparative Notes. Related to *C. geminata* Wied. from which it may be separated by its larger size, the crossband of the wing not attaining the hind margin, and the black spots on the second abdominal tergite usually attaining the hind margin.

Remarks. I accept the synonymy of Kröber (1926). He has seen Wiedemann's type and has evidently compared specimens from this country determined as *C. hilaris* O. S.

Type Data. Female, locality doubtful, in the Museum of Vienna. I have studied the Osten Sacken types of *C. hilaris* at the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

CANADA: New Brunswick 1, July 12; Quebec 2, July 1-23.

UNITED STATES: Maine 1, June 25; New Hampshire 5, July 5-20; Vermont 1, Aug. 1; Massachusetts 1, July 14; New York 8, June 30 - Aug. 1.

In addition, reported by others from:

CANADA: Nova Scotia, Ontario.

UNITED STATES: Connecticut, New Jersey, Pennsylvania, ?Kansas.

Chrysops latifrons, new species

(Plate XXIX, fig. 4; Plate XXXIV, fig. 74; Plate XXXV, fig. 93)

Color. Yellow with black abdominal pattern; appendages yellow; crossband of wing broken by hyaline areas.

Size. Length, 7 mm.

Structural and Color Characters. Female: Entire head and its appendages yellow, except the eyes, proboscis and apical portion of the flagellum; a brown area may appear about the ocelli; the usual areas with yellow pollen. Scape of antenna much swollen, the pedicel just a little. Dorsum of thorax and scutellum yellow, the former with obscure brown stripes; pleural and sternal regions yellowish pollinose with faint brown stripes. Dorsum of abdomen yellow with a quadrate black spot under the scutellum which nearly attains the posterior margin of the first segment; segments II, III and IV with a black geminate spot, on each side of which may appear a small black spot; remaining segments black; all posterior margins yellow. Venter of abdomen yellow with a median black stripe and two lateral ones. Wings as figured. Legs yellow; apical portion of front tibiae and entire tarsi, apical tarsal segments of middle and hindlegs, and all joints, brown. Male: Predominantly black. Head and its appendages as in the female except for sex characters. Thoracic region more brown. First abdominal segment black except the yellow lateroposterior margin; second with a large black trapezoidal spot eneroached upon from the posterior margin by a yellow triangle, the yellow on each side with a small black spot; segments III, IV and V almost entirely black with a double geminate figure; remaining segments black; all segments with narrow yellow posterior margins. Venter of abdomen like the female. Wings similar to the female, except the infuscation of cell 2d M is equal to that of cell R; cell 1st A infuscated at the base. Legs as described for the female except that the front femora and hind tibiae show some brown at the apices.

Comparative Notes. Related to *C. pachycera* Will., from which

it may easily be separated by the toothlike prolongation of the crossband which attains the bifurcation of vein R_{4+5} .

Type Data. Holotype, female; Fairbanks Ranch, Ash Meadows, 2,300 feet; Amargosa Desert, Nevada; (R and H); August 17, 1919. Allotype, male; Owens, Nevada; Clark county, August 23, 1919; 3,000 feet. Paratypes, one female same data as holotype; one female, same data as allotype.

All specimens received from the Philadelphia Academy of Natural Science. Holotype, allotype and one paratype to be deposited there; one paratype in the Francis Huntington Snow Entomological Collection of the University of Kansas.

Chrysops lugens Wiedemann (1821)

(Plate XXXIII, fig. 54)

1821. *C. lugens* Wiedemann, Dipt. Exot., I, 109.

1828. *C. lugens* Wiedemann, Auss. Zw., I, 212.

1903. *C. lugens* Hine, Ohio State Acad. Sci. Spec. Pap. No. 5, p. 39.

1907. *C. lugens* Daecke, Ent. News, XVIII, 142.

1907. *C. lugens* Hine, Bull. 93, La. Exp. Sta., 30.

1926. *C. lugens* Kröber, Stett. Ent. Ztg., LXXXVII, 315.

Color. Fuscous, sometimes with a faint grayish middorsal abdominal stripe.

Size. Length, 6.5 mm. to 8 mm.

Structural and Color Characters. Female: Vertex gray-yellow pollinose; frons and sides of genae yellow pollinose; ocellar area, frontal callus, a line connecting them, sides of frontoclypeus, oral margins of genae, and palpi fuscous; remainder of frontoclypeus and basal segments of antennae yellow or brown-yellow; flagellum mostly black. Thoracic dorsum and scutellum fuscous, the former with grayish pollinose stripes; pleurae and venter fuscous with the usual gray yellow pruinosity. Abdomen fuscous; sometimes the dorsum with a faint grayish mid-stripe and the venter with a little gray yellow on the sides near the base. Halteres fuscous. Wings as figured. Legs yellow, the trochanters, base of front tibiae and entire tarsi, bases of middle and hind femora, apex of hind tibiae, apical segments of middle and hind tarsi, fuscous. Male: Similar to the female except for sex characters. The male of Hine (1903) with the broad yellow thoracic stripes may be *C. obsoleta* Wied.

Comparative Notes. The wing picture is much like that of *C. parvula* Daecke except that the apical spot more nearly approximates the posterior margin. The generally larger size of *C. lugens* and the dominant yellow of the hind femora and tibiae readily separate it from *C. parvula*.

Type Data. Described from a male specimen from Savannah. In the Vienna Museum. Kröber (1926) states that there is no specimen recognizable as the type.

Distributional Data:

UNITED STATES: Connecticut 1, June 30; Maryland 12, May 5-July 10; District of Columbia 1, July 3; Virginia 6, June 18-July 13; North Carolina; Georgia 1, Aug. 3; Florida 4, Feb. 25-Aug. 19; Alabama 1, July 21; Illinois 1, Aug. 27.

In addition, reported by others from:

UNITED STATES: New York, New Jersey, Ohio, Louisiana.

Chrysops mitis Osten Sacken (1875)

(Plate XXX, fig. 18)

1875. *C. mitis* Osten Sacken, Prodrôme, I, 374.

1904. *C. mitis* Hine, Ohio Nat., V, 224.

1907. *C. mitis* Daecke, Ent. News, XVIII, 140.

1926. *C. mitis* Kröber, Stett. Ent. Ztg., LXXXVII, 247.

1926. *C. mitis* Cameron, Bull. Ent. Res., XVII, 22.

1931. *C. mitis* Philip, Minn. Tech. Bull., LXXX, 89.

Color. Black.

Size. Length, 8.5 mm. to 11 mm.

Structural and Color Characters. Female: Vertex, frons, a mid-streak on the frontoclypeus, sides of genae, gray pollinose; ocellar area, frontal callus, frontoclypeus, oral region of genae and palpi, black; scape, basal portion of pedicel, and base of flagellum red yellow; remainder of antennae black. Dorsum of thorax and scutellum black, pale pubescent, the former with faint gray stripes; pleurae and venter black, the former with dense gray-yellow pile except for the black pile of the humeri. Abdomen black with light and dark pubescence intermixed; small gray middorsal triangles on segments II, III and IV. Halteres black. Wings as figured; extent of infuscation in cells R and 2d M, and the cubital area variable. Legs black; bases of median and posterior metatarsi red yellow. Male: Like the female except for sex characters. The gray pubescence and pile replaced by black.

Comparative Notes. Generally more robust than *C. carbonaria* Walker, from which it may also be separated by the infuscation at the base of cell Cu₁ of the wing. See under description of *C. carbonaria*.

Type Data. Described from nine females from British Possessions in North America from Canada to the Mackenzie and Yukon rivers and Lake Superior. In the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

CANADA: Quebec 2, May 25 - July 3; Manitoba 1, June 10; Northwest Territory 1, July 15-28.

UNITED STATES: New Hampshire 1; New York 1; Wisconsin 2, May 26 - June 22; Illinois 1, June 15; Minnesota 4, June 24 - July 16; North Dakota 3, June 18-21; Montana 2, Aug.; Wyoming 1, July 12-30; Colorado 3, June 30; Idaho 5, July; Washington 1; Oregon 1.

In addition, reported by others from:

CANADA: Labrador, Ontario, Saskatchewan, Alberta, British Columbia.

UNITED STATES: Maine, Vermont, Massachusetts, New Jersey?, Utah.

Chrysops moecha Osten Sacken (1875)

(Plate XXXIII, fig. 59)

1875. *C. moechus* Osten Sacken, Prodrôme, I, 387.

1901. *C. moechus* Hine, Ohio Nat., II, 168.

1903. *C. moechus* Hine, Ohio St. Acad. Sci. Spec. Pap. No. 5, p. 39.

1906. *C. moechus* Daecke, Ent. News, XVII, 40.

1907. *C. moechus* Daecke, Ent. News, XVIII, 141.

1907. *C. moechus* Hine, Bull. 93, La. Exp. Sta., p. 31.

1918. *C. moechus* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 197.

1920. *C. moechus* Marchand, Mon. Rock. Inst. No. 13, p. 49.

1926. *C. moechus* Kröber, Stett. Ent. Ztg., LXXXVII, 332.

1930. *C. moechus* Schwardt and Hall, Bull. 256, Ark. Exp. Sta., 14.

1930. *C. moechus* Stone, Ann. Ent. Soc. Am., XXIII, 283.

1931. *C. moechus* Philip, Minn. Tech. Bull., LXXX, 89.

Color. Female, yellow with black abdominal stripes; male, black.

Size. Length, 7 mm. to 8 mm.

Structural and Color Characters. Female: Vertex, frons, and sides of genae, yellow pollinose; frontal callus and a spot on the oral margin of the genae black; frontoclypeus, remainder of genae, and palpi, yellow; scape and pedicel of antenna yellow, flagellum, except base, black. Rarely, the frontal callus is yellowish. Dorsum of thorax green-gray pruinose with brown stripes; scutellum yellow with a green-gray or brown spot on the disc; pleurae and venter yellow with the usual brown stripes. Dorsum of abdomen yellow with two broken black median stripes extending from segment V almost to the anterior margin of II, on which segment they often converge; on each side a broken black stripe from segment V to segment III or II; a small black spot beneath the scutellum; segments VI and VII black. Venter of abdomen yellow; the usual lateral streaks and the apical two or three segments, black. Halteres fuscous. Wings as figured; the very small hyaline triangle not exceeding vein M_1 is characteristic. Legs yellow; trochanters, apical portion of anterior tibiae and entire tarsi, basal portion of

posterior femora, apices of median and posterior tarsi, black. Male: Much different than the female, but readily associated by the hyaline triangle of the wing. Antennae, sides of frontoclypeus, oral margin of genae, and palpi, black. Whole body, except traces of gray-yellow pruinose stripes on the thoracic dorsum and pleurae, and a touch of yellow on the sides of the abdomen, black. Wings entirely infuscated except the small hyaline triangle and a tiny spot near the apices of cells R and 2d M; the cubital and anal areas more dilute. Legs black; base of anterior tibiae, apex of median femora and entire tibiae; median and posterior metatarsi brown yellow.

Comparative Notes. The females may be mistaken for *C. univittata* Macq., but the characteristic wing picture with the reduced hyaline triangle should easily separate this species. The superlative degree of melanism in the males of *C. moccha* makes them totally different from this sex in *C. univittata*.

Type Data. Described from the District of Columbia, Georgia, Kentucky and Missouri. Two females and one male in the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

UNITED STATES: Massachusetts 1, June 28; Connecticut 1, Aug. 8; New York 1, July 30; New Jersey 3, July 2 - Aug. 4; Delaware 1, June 10; Maryland 11, June 3 - Aug. 11; District of Columbia 1, June 8; Virginia 3, June 14 - July 31; North Carolina 1, Aug. 13; Georgia 1, June 7; Pennsylvania 2, June 15-27; Michigan; Ohio 5, June 10 - July 14; Tennessee 1, June 4; Illinois 4, June 2-28; Mississippi 2, July 15 - Aug. 15; Arkansas 1, July 9; Kansas 1; Oklahoma 2, May 23-24.

In addition, reported by others from:

CANADA: Quebec.

UNITED STATES: Maine, New Hampshire, West Virginia, Kentucky, Minnesota, Missouri, Louisiana.

Chrysops montana Osten Sacken (1875)

(Plate XXXI, fig. 28)

- 1875. *C. montanus* Osten Sacken, Prodrôme, I, 382.
- 1895. *C. montanus* Townsends, Trans. Am. Ent. Soc., XXII, 57.
- 1903. *C. montanus* Hine, Ohio State Acad. Sci. Spec. Pap. No. 5, p. 40.
- 1906. *C. montanus* Daecke, Ent. News, XVII, 41.
- 1907. *C. montanus* Daecke, Ent. News, XVIII, 145.
- 1918. *C. montanus* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 197.
- 1926. *C. montanus* Kröber, Stett. Ent. Ztg., LXXXVII, 298.
- 1930. *C. montanus* Stone, Ann. Ent. Soc. Am., XXIII, 284.
- 1931. *C. montanus* Philip, Minn. Tech. Bull., LXXX, 90.

The following also refer to this species:

- 1904. *C. furcatus* Hine, Ohio Nat., V, 222.
- 1926. *C. furcatus* Kröber, Stett. Ent. Ztg., LXXXVII, 296.

Color. Yellow with black abdominal pattern.

Size. Length, 7.5 mm. to 10 mm.

Structural and Color Characters. Female: Vertex, frons and sides of genae gray yellow to yellow pollinose; frontal callus black, rarely yellowish; frontoclypeus, oral margin of genae, and palpi, yellow; scape, pedicel and base of flagellum yellow to brown-yellow; apical portion of flagellum black. Dorsum of thorax and scutellum dark brown or plumbeus, the former with the usual grayish pollinose stripes; pleurae and venter gray-yellow pollinose with fuscous stripes. Dorsum of abdomen yellow; a black quadrate spot beneath the scutellum emarginate posteriorly; the second segment with a median geminate or inverted V-shaped black figure, on each side of which is a small black spot; segments III, IV and V with four black spots which attain the anterior but not the posterior margins; sometimes segment V, along with the remaining segments, is black, only the posterior margins yellow. Venter of abdomen yellow; a median black spot on each of segments III, IV and V; sometimes also on I and II; remaining segments black with yellow posterior margins; the usual black lateral streaks present. Halteres fuscous. Wings as figured; sometimes the apical spot includes barely more than the apex of cell R_4 and the extent of infuscation in cell R is variable, in some cases nearly the whole cell being colored. Legs yellow; the trochanters, apex of front tibiae and entire tarsi, base of hind femora, apices of middle and hind tarsi, black. Male: Differs from the female throughout by a greater display of fuscous. Dorsum of thorax and scutellum fuscous, the former with obscure yellowish stripes. Dorsum of abdomen similar to female except the median figures on segments II and IV are heavy black geminate spots. Cells R and 2d M of wing infuscated except at extreme apices, light infuscation prevails in anal area of wing. Legs as in female except the base of front femora and apex of hind tibiae, black.

Comparative Notes. Osten Sacken (1875) relates this species to his *C. pudica*, but I fail to see any resemblances except in the wing picture. Philip (1931) states that some specimens of *C. montana*, especially where cell R is infuscated for more than half its total area, are near *C. striata* O. S., but the more extensive apical spot of the latter should easily separate the two. The abdominal pattern of *C. montana* resembles that of some specimens of *C. lateralis* Wied., but the wing pictures are totally different. Also, see under description of *C. furcata* Walker.

Remarks. As indicated in my description of *C. furcata* Walker, there is a large form of *C. montana* O. S. which Hine (1904) and Kröber (1926) identified as *C. furcata*; however, the latter author was doubtful. I have seen such specimens and there are no marked differences between them and the typical *C. montana* except that they are more robust. I lack sufficient evidence to raise this form to varietal rank.

Type Data. Described from two females from Catskill Mountain House, New York, July, 1874, and one female from Ogle county, Illinois. I have studied the types, in the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

CANADA: Quebec 1, Aug. 8; Ontario 1.

UNITED STATES: New Hampshire 1, July 16; Massachusetts 3, July 28 - Aug.; New York 1, Aug. 4; New Jersey 3, June 21 - July 9; District of Columbia 1, June 7; Michigan 2, June 29 - July 25; Ohio 4, June 15-19; Indiana 1, July 23; Illinois 2, July 8 - Aug. 25; Minnesota 3, July 5-9.

In addition, reported by others from:

UNITED STATES: Vermont, Connecticut, Virginia, North Carolina, Louisiana.

Chrysops nigra Macquart (1838)

(Plate XXX, fig. 16)

- 1838. *C. niger* Macquart, Dipt. Exot., I, 1, p. 161.
- 1875. *C. niger* Osten Sacken, Prodrôme, I, 377.
- 1895. *C. niger* Townsend, Trans. Am. Ent. Soc., XXII, 57.
- 1895. *C. niger* Hart, Bull. Ill. State Lab. N. H., IV.
- 1901. *C. niger* Ricardo, Ann. and Mag. N. H., ser. 7, VIII, 301.
- 1902. *C. niger* Howard, Ins. Book, pl. XV, f. 36.
- 1903. *C. niger* Hine, Ohio St. Acad. Sci. Spec. Pap. No. 5, p. 41.
- 1906. *C. niger* Daecke, Ent. News, XVII, 41.
- 1907. *C. niger* Daecke, Ent. News, XVIII, 140.
- 1918. *C. niger* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 197.
- 1926. *C. niger* Kröber, Stett. Ent. Ztg., LXXXVII, 241.
- 1928. *C. niger* Kröber, Deutsche Ent. Ztsch., p. 429.
- 1930. *C. niger* Stone, Ann. Ent. Soc. Am., XXIII, 285.
- 1930. *C. niger* Schwardt and Hall, Bull. 256, Ark. Exp. Sta., 13.
- 1931. *C. niger* Schwardt, Jl. Kans. Ent. Soc., IV, 8.
- 1931. *C. niger* Philip, Minn. Tech. Bull., LXXX, 91.

The following also refers to this species:

- 1848. *C. carbonarius* Walker, List, I, 203 (in part).

Color. Black.

Size. Length, 6.5 mm. to 8.5 mm. Philip (1931) gives 7.5 mm. to 10 mm.

Structural and Color Characters. Female: Vertex gray pollinose; frons and sides of genae yellow pollinose; ocellar area, frontal callus, a spot on each side of the frontoclypeus, oral margin of

genae, and palpi, fuscous to black; frontoclypeus and scape of antenna yellow; pedicel and base of flagellum brown-yellow; apex of flagellum black. Dorsum of thorax and scutellum black, white pubescent, the former with gray pollinose stripes; pleurae and venter gray pruinose with the usual black stripes, the former with whitish pile. Abdomen entirely black with white pubescence. Halteres black. Wings as figured. Legs black; base of anterior tibiae, basal half of median tibiae, median and posterior metatarsi, yellow. In some specimens the legs are completely black except the yellow median and posterior metatarsi. Male: Similar to the female except for sex characters. Cell 2d M of wing is mostly infuscated except a small hyaline spot near the apex; cubital and anal areas dilutely infuscated.

Comparative Notes. The yellow frontoclypeus and hyaline cell 2d M readily separates this species from all others of the group lacking an apical spot. The male is apt to be confused with that of *C. carbonaria* Walker, but also in this case the frontoclypeus offers the best character.

Type Data. Described from "Amerique du Nord." In the Museum of Lille.

Distributional Data:

CANADA: Ontario 1, July 31.

UNITED STATES: Maine 2, June 21; New Hampshire 3, July 7-12; Massachusetts 3, June 1-20; Rhode Island 1; Connecticut 1, June 20-23; New York 6, June 10-July 19; New Jersey 5, May 20-June 25; Delaware 2, June 6-9; Maryland 5, May 19-June 16; District of Columbia 1, May 21-30; Virginia 6, May 23-June 10; North Carolina 1, May 20; Pennsylvania 9, May 17-July 12; Michigan; Ohio 7, May 23-Aug. 23; Indiana 1, May 27-June 15; Wisconsin 1, June; Illinois 4, May 10-June 5; Missouri 1; Arkansas 1, June 7-11.

In addition, reported by others from:

CANADA: Newfoundland, Nova Scotia, Quebec.

UNITED STATES: Minnesota, Montana.

Chrysops nigribimbo Whitney (1879)

(Plate XXX, fig. 17)

1879. *C. nigribimbo* Whitney, Can. Ent., XI, 35.

1906. *C. nigribimbo* Daecke, Ent. News, XVII, 41.

1907. *C. nigribimbo* Daecke, Ent. News, XVIII, 141.

Color. Fuscous; crossband of wing obsolete.

Size. Length, 5.5 mm. to 7 mm.

Structural and Color Characters. Female: Vertex, frons and sides of genae gray pollinose; ocellar area, frontal callus, a spot on each side of the frontoclypeus, another on the oral margin of

the genae, fuscous; palpi and scape of antenna yellow, the latter often with some fuscous; pedicel and base of flagellum brown-yellow; apical portion of flagellum black. Entire body fuscous, white pubescent; the pleurae with the usual gray pruinosity and white pile. Halteres fuscous. Wings as figured, the picture very dilute, almost obsolete, most saturate along the costal margin and the stigma. Legs fuscous; front coxae, proximal portion of front tibiae, middle and hind metatarsi and sometimes the middle femora and tibiae, brown-yellow. Male: Like the female in all respects except for sex characters. The head is relatively quite large.

Comparative Notes. This species is distinct from all others in our North American fauna. It is most closely related to *C. hyalina* Shan., but may at once be separated by the presence of a wing picture. See under description of *C. hyalina*.

Remarks. To my knowledge this is the first time the male has been described.

Type Data. Described from Milford, New Hampshire. I have studied the types. Four females in the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

UNITED STATES: New Hampshire 1; Rhode Island 1; New York 1, June 30; New Jersey 1, June 21 - Aug. 15; North Carolina 1, May 16 - June 22; Florida 1.

In addition, reported by others from:

UNITED STATES: Massachusetts.

Chrysops nigripes Zetterstedt (1838)

(Plate XXXI, fig. 36)

- 1838. *C. nigripes* Zetterstedt, Ins. Lapp., p. 519.
- 1842. *C. nigripes* Zetterstedt, Dipt. Scand., I, 125.
- 1858. *C. nigripes* Loew, Verh. Z. B. Ges. Wien., p. 623.
- 1875. *C. nigripes* Osten Sacken, Prodrôme I, 394.
- 1904. *C. nigripes* Hine, Ohio Nat., V, 224.
- 1923. *C. nigripes* Hine, Can. Ent., IV, 145.
- 1926. *C. nigripes* Kröber, Stett. Ent. Ztg., LXXXVII, 323.

Color. Black, abdominal tergites with gray hind margins which expand into median triangles.

Size. Length, 8 mm. to 10 mm.

Structural and Color Characters. Female: Vertex, frons, a mid-streak on the frontoclypeus, sides of genae, gray pollinose; frontal callus, frontoclypeus, oral margins of genae, palpi, and antennae, fuscous to black; sometimes the inner surfaces of the basal antennal segments are reddish. Dorsum of thorax and scutellum black, pale-yellow pubescent, the former with gray-pollinose stripes; pleurae

and venter black with a gray pruinosity, the former with pale-yellow pile and a trace of black pile on the humeri. Dorsum of abdomen black; first segment with posterolateral angles and the very narrow hind margin gray yellow; the black of the second segment is encroached upon from each side by gray yellow; all segments caudad from II with conspicuous gray hind margins which on II to V expand into middorsal triangles. Venter of abdomen black, the segments with gray hind margins; a small patch of yellow on each side near the base usually present. Halteres fuscous. Wings as figured; the tooth-like projection of the crossband characteristic. Legs black; the base of the front tibiae, middle and hind metatarsi, brown. Male: According to Kröber (1926), who has redescribed this species from European specimens, this sex differs from the female as follows: The dorsum of the thorax lacks the gray stripes; the pleurae are black pilose; the gray hind margins of the abdominal tergites do not expand into triangles; there is a greater extent of infuscation in cells R and 2d M of the wings.

Comparative Notes. This species has no close American relatives. From both *C. noctifera* O. S. and *C. pertinax* Will. it is readily distinguished by the conspicuous gray hind margins of the abdominal tergites which in the female expand into median triangles, and by the tooth-like projection of the crossband of the wing.

Remarks. This species is the only European *Chrysops* undoubtedly represented in boreal North America.

Type Data. One female. In the Museum of Lund.

Distributional Data:

CANADA: Manitoba: Kettle Rapids, near Winnipeg, July 16, 1917.

UNITED STATES: Maine: Saddleback Lake, July 18-20, 1916. Montana: Lakeview, Aug. 4, 1920. Alaska: Nenana, July 5-7, 1921; Anchorage, July 21, 1921; Savonoski, Naknek Lake, Aug. 5, 1919; Fairbanks, June 30, 1921; Kukak Bay, July 4, 1899.

Chrysops noctifera Osten Sacken (1877)

(Plate XXX, fig. 23)

1877. *C. noctifer* Osten Sacken, West Dipt., p. 220.

1904. *C. noctifer* Hine, Ohio Nat., V, 224 (*C. pertinax* Will. a syn.).

1927. *C. noctifer* Cole, Proc. Cal. Acad. Sci., XVI, 420 and 469, f. 72.

The following also refers to this species:

1927. *Chrysops* sp. near *sordidus* Essig, Pan. Pac. Ent., IV, 186.

Color. Shining black, dorsum of abdomen with a yellow spot on each side near the base.

Size. Length, 8 mm. to 9.5 mm.

Structural and Color Characters. Female: Vertex, frontal callus,

frontoclypeus, and genae, black; sides of vertex, frons, a mid-streak on the frontoclypeus, and sides of genae, gray-yellow pollinose. Antennae slender; scape and pedicel yellowish, flagellum mostly black, slightly thicker than the scape. Palpi and proboscis reddish-brown. Dorsum of thorax and scutellum black with whitish pubescence, the former with obscure gray stripes; pleurae and venter black, the former with dense grayish-yellow pile and some black pile on the humeri. Dorsum of abdomen black, encroached upon anterolaterally by two large yellow spots; faint grayish middorsal triangles sometimes visible on segments II, III and IV. Venter of abdomen black with a greater extent of yellow anterolaterally. Wings as figured; the apical spot narrow and practically separated from the crossband which does not reach the posterior margin of the wing. Legs black; base of tibiae, median and posterior metatarsi, red-brown; anterior coxae and posterior femora with long whitish hair. Male: To my knowledge this sex has not been reported.

Comparative Notes. Separated from *C. pertinax* Will. principally by the yellow lateral spots on the abdomen. Taken by series, *C. noctifera* is smaller than *C. pertinax*. I have seen specimens of *C. excitans* Walker with a trace of an apical spot which might easily be confused with *C. noctifera*, but in this instance the geographic distribution of these species will aid in separation.

Type Data. Described from four females, Sierra county, California, July 20, 27. I have studied the types in the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

UNITED STATES: California: Sacramento, June 4, 1915; Fallen Leaf, July 15, 1917; Sonoma Co.; Fallen Leaf Lake; Lake Tahoe, June 12-30, 1930, June 28, 1931; Tahoe, June 10-16, 1916; Truckee, July 16, 1916; Echo Lake, Aug. 22, 1927.

In addition, reported by others from:

UNITED STATES: New Mexico.

Chrysops obsoleta Wiedemann (1821)

(Plate XXXIII, fig. 50)

1821. *C. obsoletus* Wiedemann, Dipt. Exot., p. 108.

1828. *C. obsoletus* Wiedemann, Auss. Zw., I, 211.

1926. *C. obsoletus* Kröber, Stett. Ent. Ztg., LXXXVII, 315.

The following also refer to this species:

1838. *C. trinotatus* Macquart, Dipt. Exot., I, 1, 161.

1875. *C. morosus* Osten Sacken, Prodrome I, 389.

1903. *C. lugens* Hine, Ohio St. Acad. Sci. Spec. Pap. No. 5, p. 39 (in part).

1907. *C. lugens* Hine, Bull. 93, La. Exp. Sta., p. 30 (in part).

1907. *C. lugens morosus* Daecke, Ent. News, XVIII, 142.

Color. Fuscous; abdominal dorsum with three more or less obsolete yellow stripes.

Size. Length, 7.5 mm. to 8.5 mm.

Structural and Color Characters. Female: Vertex gray-yellow pollinose; frons and sides of genae yellow pollinose; ocellar area, frontal callus, a spot on each side of the frontoclypeus, another on each side of the oral margin of the genae, and palpi, fuscous; remainder of frontoclypeus and genae brown-yellow; scape of antenna yellow, pedicel and base of flagellum brown-yellow, apex of flagellum black. Dorsum of thorax and scutellum fuscous, the former with gray to gray-yellow pollinose stripes, the latter sometimes yellowish near the tip; pleurae and venter yellow pollinose with the usual fuscous stripes. Dorsum of abdomen fuscous with three more or less obscure yellow stripes which begin near the base and fade out near the apex, their length variable. Venter of abdomen fuscous with a variable amount of yellow on the sides near the base. Halteres fuscous. Wings as figured; cell R completely infuscated, the cubital and anal areas hyaline or dilutely infuscated. Legs yellow; joints, apical portion of front tibiae and entire tarsi, bases of middle and hind femora, sometimes the apex of the hind tibiae, apical segments of middle and hind tarsi, fuscous. Male: Similar to the female except for sex characters. Wiedemann (1928) states that the abdomen lacks stripes. Kröber (1926) states that the male designated as the type is much greased. Osten Sacken (1875) in his description of *C. morosus* states that the male in its essential character is like the female and that the three yellow abdominal stripes are very distinct.

Comparative Notes. Separated from *C. lugens* Wied. by the three yellow abdominal stripes and the more arcuate and narrow hyaline triangle of the wing. The wing picture is much like that of *C. ultima* Whit., but that species has the abdomen almost entirely fuscous and the pleural stripes are gray pollinose. From *C. parvula* Daecke, *C. obsoleta* is distinguished by the abdominal stripes, the wing picture, the dominance of yellow on the hind legs, and its generally larger size. *C. wiedemanni* Kröber, the *C. obsoletus* of authors, is an entirely different fly, at once distinguished from *C. obsoleta* Wied. by the hyaline cell 2d M.

Remarks. The characters used for separating *C. obsoleta*, *C. lugens*, *C. ultima*, and *C. parvula* must be employed with care, for these are all very close. In large series the characters most readily

discernible intergrade. It is quite probable that future work may bring some of these species into synonymy.

Type Data. Through the courtesy of the Museum of Vienna, I received one type female (Savannah) for study. It is in excellent condition, slightly faded, and unfortunately the hind legs are missing. However, the fundamental characters are well preserved.

Distributional Data:

UNITED STATES: New Jersey 1, July 28; Delaware 2, July 14-24; Maryland 3, June 13-July 31; District of Columbia 1, July 7; North Carolina 1, May 26; Ohio 1.

In addition, reported by others from:

UNITED STATES: Massachusetts, Connecticut, New York, Georgia, Florida, Pennsylvania, Louisiana.

Chrysops ornata Kröber (1926)

1926. *C. ornatus* Kröber, Stett. Ent. Ztg., LXXXVII, 328.

I have not been able to identify this species. It belongs in Kröber's "*Gruppe vittatus*." According to description, the length is 8.5 mm. Frontal callus and frontoclypeus yellow; antennae slender. Thorax with the usual yellowish pollinose and brown stripes; scutellum yellow. The pattern of the abdominal dorsum is peculiar; the black cruciform median spot on the fourth tergite seems characteristic. The wing picture is not markedly different from that of *C. vittata* Wied. Legs yellow with the usual fuscous areas.

Described from one female, Jordan, Ontario. In Kröber's collection.

Chrysops pachycera Williston (1887)

(Plate XXXIV, fig. 68; Plate XXXV, fig. 91; Plate XXXVII, figs. 108, 109)

1887. *C. pachycera* Williston, Trans. Kans. Acad. Sci., X, 134.

1895. *C. pachycera* Townsend, Proc. Cal. Acad. Sci., ser. 2, IV, 596.

1903. *C. pachycera* Adams, Kans. Univ. Sci. Bull., II, 442 (Type ♂ = *C. proclivis* O. S.).

1904. *C. pachycera* Hine, Ohio Nat., V, 224.

1926. *C. pachycera* Kröber, Stett. Ent. Ztg., LXXXVII, 264.

Color. Yellow, with black abdominal pattern.

Size. Length, 6.5 mm. to 8 mm.

Structural and Color Characters. Female: Vertex broader than long, yellow pollinose; frontal callus, frontoclypeus, genae, and palpi yellow, the usual areas pollinosed; sometimes a small spot on the oral margins of the genae and the upper border of the frontal callus, brown; antennae incrassate, especially the scape, mostly yellow or brown-yellow except for the black apical portion of the

flagellum; scape and pedicel with coarse black pubescence. Dorsum of thorax and scutellum typically yellow-gray pollinose with whitish pubescence, the former with the usual dark stripes; pleurae and venter yellow pollinose, some brown ground color showing through. Dorsum of abdomen yellow; a black quadrate spot beneath the scutellum, posteriorly emarginate, not attaining the hind margin of the first segment; second segment with a small median black geminate figure (sometimes this figure assumes the form of two divergent spots) which attains neither margin; segments II to VI each with a median pair of black subtriangular spots whose bases are directed anteriorly; segment VII usually black with a yellow hind margin, sometimes the sixth segment approaches this condition; rarely, obscure black lateral spots are present on all segments caudad from III. Venter yellow with a narrow black median stripe and a lateral stripe running full length; apical two or three segments black with yellow hind margins. Halteres yellow. Wings as figured; sometimes the crossband is fenestrate. Legs yellow; joints, apex of front tibiae and entire tarsi, apical segments of middle and hind tarsi, black. Male: Head like the female except for sex characters. Dorsum of thorax and scutellum more brown. Dorsum of abdomen yellow; the black spot beneath the scutellum more extensive than in the female; segments II and III each with a heavy median geminate black spot; remaining segments much like the female; the sixth typically with a black lateral spot. Venter of abdomen like the female. Wings like the female, except for a greater extent of infuscation in cells R and 2d M, that of 2d M being about equal to R. Legs very similar to the female.

Comparative Notes. Closely related to *C. latifrons* n. sp., but that species is easily distinguished by the tooth-like projection of the crossband. *C. pachycera* is smaller and predominantly more yellow than *C. coquilletti* Hine. See, also, under description of *C. coquilletti*. The presence or absence of infuscation at the base of cell 1st A in the male (a character mentioned in most of the literature) appears to be of no taxonomic value. See description of *C. hungerfordi* n. sp.

Remarks. The characters used by Hine (1904) in his key are not very satisfactory for separating *C. pachycera* from *C. coquilletti*, although the species are very distinct. To make matters worse, Kröber (1926) in his key has absolutely reversed the characters used by Hine.

Type Data. Unfortunately the types have disappeared. De-

scribed from three specimens from California, the male of which has proved to be *C. proclivis* O. S.

Distributional Data:

UNITED STATES: Utah: Zion National Park, Aug. 13, 1929; Pintura, Aug. 11, 1929; St. George, June 5-7, 1919, June 2, 1928. Arizona: Bill Williams Fork, August; Lewis Springs, Aug. 5, 1907; Dripping Springs, Aug. 31, 1920.

MEXICO: Lower California.

In addition, reported by others from:

UNITED STATES: Oregon.

Chrysops parvula Daecke (1907)

(Plate XXXIII, fig. 51)

1907. *C. parvulus* Daecke, Ent. News, XVIII, 142.

1918. *C. parvulus* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 197.

1926. *C. parvulus* Kröber, Stett. Ent. Ztg., LXXXVII, 314.

1930. *C. parvulus* Schwardt and Hall, Bull. 256, Ark. Exp. Sta., 13.

The following also refers to this species:

1875. *C. morosus* Osten Sacken, Prodrôme I, 390 (in part).

Color. Fuscous.

Size. Length, 5.5 mm. to 7 mm.

Structural and Color Characters. Female: Vertex and sides of genae gray-yellow pollinose; ocellar area, frontal callus, a line connecting them, a large spot on each side of the frontoclypeus, oral margins of genae, and palpi, fuscous; the disc of the frontoclypeus usually brown-yellow; sometimes, however, this region is entirely fuscous; antennae slender; scape and pedicel, and sometimes the extreme base of the black flagellum, yellow to brown-yellow. Thorax and scutellum fuscous, the former with faint gray pollinose stripes; pleurae and venter gray-yellow pollinose with the usual fuscous stripes. Abdomen entirely fuscous. Halteres fuscous. Wings are figured; the apex of the hyaline triangle not attaining vein R_{2+3} and the apical spot not often exceeding vein R_5 . Legs yellow; the trochanters, apex of front femora, apical three fourths of front tibiae and entire tarsi, base of middle femora, most of the hind femora and tibiae, except at their extreme apex and base, respectively, apical segments of middle and hind tarsi, fuscous. Male: This sex has never been reported, unless one is to accept the male with the wholly brown abdomen mentioned by Osten Sacken (1875) under his description of *C. morosus*.

Comparative Notes. This species is no doubt the smallest of its group and is distinguished by its fuscous abdomen and typically

fuscous hind femora and tibiae. See, also, under description of *C. lugens* Wied.

Remarks. Daecke (1907) offers an additional means of separating *C. parvula* from *C. lugens* by the eye pattern. The former having the frontal spot usually excised anteriorly and the occipital border separated from the occiput, the latter with a solid frontal spot and the occipital border connected with the occiput.

Type Data. Described from a large series, most of them from Bamber, New Jersey, July 9, 1906. I have studied the types in the United States National Museum.

Distributional Data:

UNITED STATES: New Jersey: Lakehurst, July 2-3, 1912, July 25; Bamber, July 9, 1906; Jersey City; Rawlins, Aug. 11, 1907; Hammondton, June 27, 1933. Florida: Hilliard, Aug. 19, 1930. Arkansas: Washington Co., Aug. 16, 1929; Fayetteville, Aug. 12, 1929.

In addition, reported by others from:

UNITED STATES: North Carolina.

Chrysops pertinax Williston (1887)

(Plate XXX, fig. 24)

1887. *C. pertinax* Williston, Trans. Kans. Acad. Sci., X, 132.

1901. *C. pertinax* Ricardo, Ann. and Mag. N. H., ser. 7, VIII, 307.

The following also refers to this species:

1892. *C. nigriventris* Bigot, Mem. Soc. Zoöl. France, V, 604.

1926. *C. noctifer* Kröber, Stett. Ent. Ztg., LXXXVII, 308.

Color. Black.

Size. Length, 8.5 mm. to 11 mm.

Structural and Color Characters. Female: Vertex gray pollinose; frons, a mid-streak on the frontoclypeus, and sides of genae, yellowish pollinose; ocellar area, frontal callus, frontoclypeus, oral margins of genae, palpi, and proboscis, black; antennae variable, usually black except for some yellow at the basal portion of the scape; sometimes the bases of the pedicel and flagellum are red-brown. Dorsum of thorax and scutellum black with light-gray pubescence, the former with faint gray pollinose stripes; pleurae and venter black, the former with dense yellowish-gray pile and on the humeri black pile. Abdomen black, white pubescent with some black intermixed; tergites II to IV often with grayish mid-dorsal triangles. Halteres black. Wings as figured; some variation in the extent of infuscation in cells R and 2d M. Legs black; the middle and hind metatarsi, and sometimes the extreme bases of all

the tibiae, red-brown. Male: Like the female except for sex characters. Antennae wholly black. Entire body black, the pubescence and pile brown or black. Wings with a greater extent of infuscation in cells R and 2d M. Legs similar to the female.

Comparative Notes. See under description of *C. noctifera* O. S. Superficially the species resembles *C. mitis* O. S., but the presence of an apical spot immediately distinguished *C. pertinax*.

Remarks. I am taking this species out of synonymy because I fail to find any intergrading forms. I have studied both Osten Sacken's types of *C. noctifera* and Williston's types of *C. pertinax*, and in addition, large series of both species. In very few specimens of *C. pertinax* I have observed just a faint trace of yellow on the sides of the abdomen near the base. This species is more robust and is principally northwestern in distribution. I have no records of *C. noctifera* north of California. Kröber described the male under *C. noctifera*.

Type Data. Described from eight females from Washington Territory, of which two cotypes (one of which I am designating and labeling as the lectotype) remain in the Francis Huntington Snow Entomological Collection of the University of Kansas.

Distributional Data:

CANADA: Alberta 1, July 3 - Aug. 23; British Columbia 4, May 9 - June 25.

UNITED STATES: Michigan 1, July 4; Montana 3, June 27 - Aug. 14; Wyoming 2, July 18 - Aug. 18; Utah 3, June 23 - July 26; Idaho 2, June 8 - July 10; Washington 14, May 26 - Aug. 5; Oregon 10, July 10-26; California 2, May 20-25.

In addition, reported by others from:

CANADA: Ontario.

Chrysops pikei Whitney (1904)

(Plate XXXII, fig. 47)

1904. *C. pikei* Whitney, Can. Ent., XXXVI, 205.

1904. *C. pikei* Hine, Ohio Nat., V, 224.

1907. *C. pikei* Hine, Bull. 93, La. Exp. Sta., 33.

1924. *C. pikei* Wehr, Neb. Univ. Studies, XXII, 113.

1926. *C. pikei* Kröber, Stett. Ent. Ztg., LXXXVII, 336.

1930. *C. pikei* Schwardt and Hall, Bull. 256, Ark. Exp. Sta., 13.

1931. *C. pikei* Schwardt, Jl. Kans. Ent. Soc., IV, 9.

Color. Yellow and black, abdomen vittate.

Size. Length, 6.5 mm. to 8 mm.

Structural and Color Characters. Female: Vertex, frons, sides of genae, yellow pollinose; frontal callus black; frontoclypeus, oral margins of genae and palpi, yellow, sometimes a black spot on the

oral margin of the genae and each side of the frontoclypeus; antennae slender; scape, pedicel and base of flagellum yellow; apex of flagellum black. Dorsum of thorax gray-yellow pruinose with fuscous stripes; scutellum yellow with a fuscous spot on the disc (usually a continuation of the median stripe of the thoracic dorsum); pleurae and venter yellow pollinose with the usual fuscous stripes. Abdominal dorsum yellow with four longitudinal black stripes, the lateral ones extending toward the base not beyond the posterior margin of the second tergite. Venter of abdomen yellow; usually a small median black spot on each of segments III, IV and V; remaining segments black with yellow hind margins; the usual lateral streaks present. Halteres black. Wings as figured; the hyaline triangle broadly open, its apex not exceeding vein R_{2+3} . Legs yellow; apical portion of front tibiae and entire tarsi, middle and hind coxae, trochanters, and apical tarsal segments, black. Male: Like the female except for sex characters. The fuscous stripes of the thoracic and abdominal dorsum are broader. Apical abdominal segments black.

Comparative Notes. A distinct species. Usually separated from the more variable *C. sequax* Will. by the incomplete lateral abdominal stripes and the hyaline triangle of the wing, which is more broadly open. The males of these species are quite distinct.

Type Data. Described from eleven females, Pike county, Missouri.

Distributional Data:

UNITED STATES: New Jersey 1; North Carolina 1, May 30; Ohio 17, May 30 - Aug. 21; Indiana 4, June 15 - Sept. 22; Alabama 1, July 22; Illinois 7, June 7 - July 23; Mississippi 1, July 15; Iowa 1, June 17; Arkansas 2, May 2 - June 27; Louisiana 6, April - Sept. 6; Kansas 23, June 3 - Aug. 27; Oklahoma 2, May 23-24; Texas 3, April 26 - May 12.

In addition, reported by others from:

UNITED STATES: Missouri, Nebraska.

Chrysops pilumna Kröber (1926)

1926. *C. pilumnus* Kröber, Stett. Ent. Ztg., LXXXVII, 278.

I have not satisfactorily identified this species. Some northwestern forms of *C. frigida* O. S. (which ultimately may prove to be a distinct species) coincide fairly well with Kröber's description except for the black on the frontoclypeus and genae, and the abdominal pattern.

Doctor Walley, of the Canadian National Museum, who kindly

compared one of my specimens with Kröber's type, states as follows: "Wing pattern exactly as figured by Kröber. The maculate portion is much darker brown than in your specimen and does not fade out in the apices of marginal, first and second submarginal cells as it does in your specimen. General dorsal abdominal pattern as figured by Kröber except that first tergite is entirely dark except small posterolateral angles and there is no narrow pale posterior margin as he has shown; median black portion of second tergite slightly broader than shown by Kröber thus with narrow pale lateral areas; following tergites as in Kröber's figure. Frontoclypeus, face and genae uniformly yellow, shining, with yellowish pollinose areas as in your specimen except that the median pollinose stripe on the frontoclypeus is lacking in the type; the deep frontal fossae are brownish and the lower margins of the genae are bordered with pale brownish. Antennae (only two basal segments present) dark brownish shaded with blackish above, much as in your specimen, but a little darker throughout. There is not a well-defined line separating the large upper facets from the small lower ones, the transition is about as in your specimen; the upper facets are noticeably larger than the lower facets, the difference in size being greater than in your specimen. Leg color . . . front legs agree with your specimen; mid-coxae, trochanters, basal fourth of mid-femora and apices of mid-tarsi dull brownish black, the apical third of hind femora and entire hind tibiae uniformly yellowish-brown."

Described from one male, Jordan, Ontario. In the Canadian National Collection, type No. 2491.

Chrysops proclivis Osten Sacken (1877)

(Plate XXXI, fig. 29)

- 1877. *C. proclivis* Osten Sacken, West Dipt., p. 222.
- 1901. *C. proclivis* Ricardo, Ann. and Mag. N. H., ser. 7, VIII, 306.
- 1903. *C. proclivis* Hine, Can. Ent., XXXV, 244.
- 1904. *C. proclivis* Hine, Ohio Nat., V, 225.
- 1926. *C. proclivis* Cameron, Bull. Ent. Res., XVII, 24 (larva and pupa), fig.
- 1926. *C. proclivis* Kröber, Stett. Ent. Ztg., LXXXVII, 320.

The following also refer to this species:

- 1887. *C. pachycera* Williston, Trans. Kans. Acad. Sci., X, 134 (in part).
- 1892. *C. atricornis* Bigot, Mem. Soc. Zool. France, V, 604.

Color. Black and yellow, the former predominant.

Size. Length, 7.5 mm. to 9 mm.

Structural and Color Characters. Female: Vertex grayish pollinose; frons and sides of genae yellow pollinose; ocellar area, frontal callus, a connecting line between them, a spot on each side of the

yellow frontoclypeus, and oral margins of the genae, fuscous to black. Palpi and antennae mostly fuscous, often with some red-brown showing through; scape, pedicel and base of flagellum sometimes yellow-brown. Dorsum of thorax and scutellum fuscous, yellow pubescent, the former with narrow gray pollinose stripes; pleurae and venter gray-yellow pollinose with the usual fuscous stripes, the former with yellow pile and on the humeri some brown. Dorsum of abdomen with a dominant black pattern; the first segment yellow with a broad black quadrate spot beneath the scutellum, posteriorly emarginate, almost attaining a heavy black median geminate figure on the second segment, on each side of which is a small black spot; segments III and IV black, narrowly incised in the center by the yellow of the hind margins, and sometimes also on each side; remaining segments black with yellow hind margins. Venter of abdomen mostly black; the segments with yellow posterolateral angles and hind margins; the second segment usually yellow with a large black median spot. Halteres fuscous. Wings as figured; the apical spot very narrow, and cell R practically entirely infuscated. Legs black and yellow, the latter distributed as follows: apex of front femora and base of tibiae, apical portion of middle and hind femora, middle and hind tibiae and metatarsi; sometimes the hind tibiae are mostly black. Male: I have no specimens at hand except that of Williston's *C. pachycera*, this sex of which has generally been conceded to be *C. proclivis*. It is quite different from the female (perhaps a teneral). The antennae, except the black apex of the flagellum, and palpi are yellow. The frontoclypeus is almost completely yellow with a trace of a brown spot on each side. The oral margins of the genae instead of being fuscous, are yellow with a small fuscous spot on each side. Thorax like the female. Dorsum of abdomen predominantly black; only the narrow posterolateral angles of the first segment, yellow; segments II and III with a very broad and heavy black double geminate figure; remaining segments black with narrow yellow hind margins; sometimes the pattern on segment V approximates that of IV, but the yellow incised areas are much more reduced. Venter of abdomen much like the female, except the yellow along the sides is more conspicuous. Wings somewhat like the female; cells R and 2d M about equally infuscated, neither completely. Legs similar to the female, with a little more yellow on the front femora and tibiae.

Comparative Notes. Separated from *C. furcata* Walker by the

lateral black spots on the second abdominal tergite, but in some specimens which I believe to be *C. proclivis* these spots are obsolete. From *C. surda* O.S. this species is distinguished by the predominantly yellow frontoclypeus, its generally larger size, and a greater display of yellow on the abdomen and legs.

Type Data. Described from four females, Marin county, California. In the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

CANADA: New Brunswick 1; Alberta 2, July 10-11; Yukon Territory 1, July 1-20.

UNITED STATES: Colorado 1, July; Washington 3, June 11 - July 25; Oregon 6, June 6 - Aug. 11; California 3, June 3 - July 20.

In addition, reported by others from:

CANADA: Quebec, British Columbia.

UNITED STATES: Arizona.

Chrysops pudica Osten Sacken (1875)

(Plate XXXII, fig. 41)

1875. *C. pudicus* Osten Sacken, Prodrôme I, 381.

1876. *C. pudicus* Osten Sacken, Prodrôme II, 474.

1906. *C. pudicus* Daecke, Ent. News, XVII, 41.

1907. *C. pudicus* Daecke, Ent. News, XVIII, 145.

1907. *C. pudicus* Hine, Bull. 93, La. Exp. Sta., p. 33.

1926. *C. pudicus* Kröber, Stett. Ent. Ztg., LXXXVII, 289.

Color. Yellow, with a black abdominal pattern of variable extent and intensity.

Size. Length, 7 mm. to 8 mm.

Structural and Color Characters. Female: Vertex grayish pollinose; frons and sides of genae yellow pollinose; frontal callus typically yellow, often bordered above with brown, rarely completely brown or fuscous; frontoclypeus, genae, palpi, and antennae except the black annulate portion of the flagellum, yellow to brown-yellow. Dorsum of thorax and scutellum plumbeus, the former with fuscous stripes, the latter sometimes with yellow at the tip; pleurae and venter gray pruinose with the usual fuscous stripes. Dorsum of abdomen yellow; a broader than long quadrate black spot beneath the scutellum, not attaining the hind margin of the first segment; second segment with an inverted V-shaped black spot, variable in its divergence, attaining neither margin; segments III and IV black with yellow posterior margins which expand into small mid-dorsal triangles; remaining segments black with yellow hind margins. Venter of abdomen with a quadrate black spot which becomes

successively larger on segments III, IV and V; remaining segments black with yellow hind margins; black lateral streaks usually present; in specimens exhibiting much yellow, the entire venter is yellow except at the apex. Halteres fuscous. Wings as figured; the apical spot as a rule includes only the apex of cell R_4 , but quite frequently it extends much deeper. Legs yellow; all trochanters, middle and hind coxae, apical portion of front tibiae and entire tarsi, apical segments of middle and hind tarsi, basal portion of hind femora, apex of hind tibiae, fuscous; sometimes the hind femora and tibiae are mostly yellow. Male: At the University of Michigan are a series of males from Florida determined by Hine, which I believe to be this species. They are very similar to the females.

Comparative Notes. Separated from *C. cursim* Whit. as indicated in the key. Also see under description of *C. cursim*. Some forms of *C. pudica* (especially those with the fuscous frontal callus and the apical spot including more than the apex of cell R_4) may be confused with *C. dimmocki* Hine, but in that species the black V-shaped spot on the second abdominal tergite invariably attains the anterior margin.

Remarks. It will be seen from the description that this is a variable species and hence considerable caution must be exercised in separating it from related forms.

Type Data. Described from three females from Massachusetts and one female, locality not certain. In the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

UNITED STATES: Massachusetts 2, June 16; Rhode Island 1, July; New York 2, June 23 - July 17; New Jersey 8, June 24 - Aug. 15; North Carolina 4, May 25 - July 17; Georgia 2, May 14 - June; Florida 2, April 8 - May 12.

In addition, reported by others from:

UNITED STATES: Connecticut, Louisiana.

Chrysops robusta, new species

(Plate XXXIV, fig. 67; Plate XXXV, fig. 87; Plate XXXVII, figs. 106, 113)

Color. Fulvous, with a fuscous abdominal pattern.

Size. Length, 7 mm. to 8 mm.

Structural and Color Characters. Female: Vertex broader than long, yellow pollinose; frons, sides of genae and a mid-streak on the frontoclypeus yellow pollinose; the region immediately surrounding the antennae white pollinose; frontal callus yellow, bordered with

brown; frontoclypeus, oral margin of genae and palpi, yellow. Antennae strongly incrassate; scape and pedicel brown-yellow with rather coarse black pubescence; flagellum black except for a little yellow at its base. Dorsum of thorax and scutellum fuscous with a brownish pruinosity and long whitish pile, the former with broad fulvous pollinose stripes; pleurae and venter fulvous pollinose with whitish pile, the usual brown stripes somewhat faint. Dorsum of abdomen fulvous with a fuscous quadrate spot, posteriorly emarginate, beneath the scutellum; anterolaterally this spot relatively connects with an obscure fuscous spot on each side; second segment with a double geminate fuscous spot, the outer portions of which are narrowly lunate; segments III, IV and V each with a double geminate fuscous spot; remaining segments fuscous; all segments with narrow fulvous posterior margins. Venter of abdomen fulvous, the first three segments each with a broad fuscous quadrate median spot; the remaining segments fuscous with yellow hind margins; the usual lateral stripes present. Halteres yellow. Wings as figured. Legs yellow; the joints, apical portion of front tibiae and entire tarsi apices of middle and hind tarsal segments, black. Male: Head and its appendages like the female except for sex characters. Thorax like the female, but somewhat darker; the humeral region of the pleurae black pilose. Dorsum of abdomen predominantly black; the first segment entirely so except for a little yellow at the posterolateral angles; segments II, III and IV each with a double geminate black figure whose outer portions, especially on the second segment, are narrow; remaining segments black with yellow hind margins; sometimes segment V bears a black figure suggestive of that on the preceding segment. Venter yellow with a broad black mid-stripe and on each side a narrow lateral one; apical segments mostly black with yellow hind margins. Halteres yellow. Wings like the female except for a greater extent of infuscation in cells R and 2d M; base of cell 1st A infuscated. Legs like the female.

Comparative Notes. This species is related to *C. coquilletti* Hine and *C. clavicornis* n. sp. From the former it may be separated by the abdominal pattern (especially the figure on the second tergite) and by the greater extent of infuscation in cell 2d M of the wings; from the latter by the abdominal pattern, the apical spot of the wings not exceeding cell R₄, and by the scape of the antenna which is uniformly swollen for its entire length.

Type Data. Holotype, female; Los Angeles, California; May 2, 1915; M. C. VanDuzee. Allotype, male; same data. Paratype,

one male, Los Cerritos, California; March 21, 1915; M. C. Van-Duzee. In the Francis Huntington Snow Entomological Collection of the University of Kansas.

Chrysops sackeni Hine (1903)

(Plate XXXI, fig. 32)

1903. *C. sackeni* Hine, Ohio St. Acad. Sci. Spec. Pap. No. 5, 42.

1907. *C. sackeni* Daecke, Ent. News, XVIII, 145.

1926. *C. sackeni* Kröber, Stett. Ent. Ztg., LXXXVII, 287.

1931. *C. sackeni* Philip, Minn. Tech. Bull., LXXX, 95.

Color. Black and yellow, the former dominant in the abdominal pattern.

Size. Length, 7.5 mm. to 10.5 mm.

Structural and Color Characters. Female: Vertex, frons, and sides of genae, gray-yellow pollinose; frontal callus variable, yellow margined above with black, black with yellow on the disc, or wholly black; frontoclypeus, genae, and palpi, orange-yellow; antennae orange-yellow except the black apex of the flagellum. Dorsum of thorax and scutellum fuscous, the former with broad, gray pollinose stripes; pleurae and venter gray-yellow pollinose with fuscous stripes. Abdominal dorsum yellow with a dominant black pattern; a broad black quadrate spot beneath the scutellum, posteriorly emarginate, nearly reaching a heavy inverted V-shaped spot on the second segment which often follows along the posterior margin; remaining segments black with yellow posterior margins which on segments III and IV expand into middorsal triangles and narrow lateral spots. Venter of abdomen yellow with a median black spot on each segment from I to IV, becoming successively larger caudad; remaining segments black with yellow hind margins; the usual black lateral streaks; sometimes the basal three or four segments are wholly yellow. Halteres black. Wings as figured; the apical spot at its base just exceeding vein R_{2+3} ; the crossband not attaining the posterior margin. Legs orange-yellow; the joints, apex of front tibiae and entire tarsi, basal portion of hind femora, apical segments of middle and hind tarsi, black; sometimes the entire hind femora and apex of tibiae are black. Male: Head and thorax like the female except for sex characters. On the dorsum of the abdomen the black figures on segments I and II are much broader; the yellow hind margins of the remaining segments are narrower and consequently the middorsal triangles on III and IV are smaller. In one specimen the sides of III and IV are more broadly yellow than in the female. Venter of abdomen like the female. Wings with more

infuscation in cells R and 2d M; otherwise like the female. Legs darker than in the female; the front femora and sometimes the apex of the front coxae, base of middle femora, black.

Comparative Notes. Separated from *C. callida* O.S. by the broader apical spot and generally larger size; likewise I have never seen a specimen of *C. callida* with any yellow on the frontal callus.

Type Data. In the Ohio State Museum, Columbus, Ohio. Four females, Sandusky, Ohio, June 29, 1899, and July 10, 1900.

Distributional Data:

UNITED STATES: Massachusetts 2, June 28; New York 3, June 27-July 4; New Jersey 1, June 17-25; North Carolina 1, May 8; Florida 1, April 16; Michigan 5, July 3-July 18; Ohio 2, June 8-July 5; Indiana 1, July 1; Tennessee 1; Illinois 3, June 15-Aug. 24; Minnesota 1, July 12; Iowa 1, June 21; Utah.

In addition, reported by others from:

CANADA: Quebec.

UNITED STATES: Vermont, Rhode Island, Connecticut, Wisconsin.

Chrysops separata Hine (1907)

(Plate XXXIII, fig. 58)

1907. *C. separatus* Hine, Ohio Nat., VIII, 228.

1926. *C. separatus* Kröber, Stett. Ent. Ztg., LXXXVII, 311.

Color. Black.

Size. Length, 8 mm.

Structural and Color Characters. Female: Vertex, frons, sides of genae, a streak on the frontoclypeus, gray to gray-yellow pollinose; ocellar area, frontal callus, frontoclypeus, oral margin of genae, and palpi, black. Antennae mostly black, basal portions of scape, pedicel, and flagellum, yellow to brown-yellow. Thoracic dorsum and scutellum black with whitish pubescence, the former with traces of gray pollinose stripes; pleurae and venter black with some gray pruinosity, abdomen black, white pubescent. Halteres black. Wings as figured, the apical spot separated from the crossband. Legs black, extreme base of anterior tibiae, basal portion of median tibiae, median and posterior metatarsi, yellowish. Male: Like the female with much black pubescence and pilosity intermixed with a little white. Antennae almost entirely black. Wings to the distal border of the crossband almost entirely infuscated, more dilute in cells Cu₁, 1st A, and the anal angle; a small hyaline spot includes the extreme apex of cells R, 2d M and the base of cell Cu₁; apical spot like the female. Legs like the female except for the absence of yellow at the bases of the front and middle tibiae.

Comparative Notes. *C. separata* is distinct from all others included within this paper. The black color and the apical spot entirely separated from the crossband will easily identify this species.

Remarks. Kröber (1926) has misquoted Hine's description. Only the first basal cell (R) is black, not both basal cells (R and 2d M). To my knowledge this is the first time the male has been described. Brimley (1922) lists a male taken at Raleigh, North Carolina, April 20, 1921, but gives no further data.

Type Data. Holotype, female; Raleigh, North Carolina; April 18, 1906; C. S. Brimley. In the Ohio State Museum, Columbus, Ohio.

Distributional Data:

UNITED STATES: North Carolina: Raleigh. Mississippi: Agricultural College, March 19, 1921 (♂). Oklahoma: Atoka Co., May 22, 1933, May 26, 1934.

In addition, reported by others from:

UNITED STATES: Louisiana.

Chrysops sequax Williston (1887)

(Plate XXXII, fig. 48)

- 1887. *C. sequax* Williston, Trans. Kans. Acad. Sci., X, 133.
- 1904. *C. sequax* Hine, Ohio Nat., V, 225.
- 1906. *C. sequax* Daecke, Ent. News, XVII, 41.
- 1907. *C. sequax* Daecke, Ent. News, XVIII, 141.
- 1907. *C. sequax* Hine, Bull. 93, La. Exp. Sta., p. 34.
- 1918. *C. sequax* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 198.
- 1924. *C. sequax* Wehr, Neb. Univ. Studies, XXII, 113.
- 1926. *C. sequax* Kröber, Stett. Ent. Ztg., LXXXVII, 345.
- 1930. *C. sequax* Schwardt and Hall, Bull. 256, Ark. Exp. Sta., 14.
- 1931. *C. sequax* Philip, Minn. Tech. Bull., LXXX, 92.

Color. Black and yellow with vittate abdominal pattern.

Size. Length, 8 mm. to 9 mm.

Structural and Color Characters. Female: Vertex grayish yellow pollinose; sides of genae yellow pollinose; frontal callus black, but not infrequently with some yellow; frontoclypeus, except a black spot on each side, palpi and antennae, except the black apex of the flagellum, yellow; oral margins of genae black. Dorsum of thorax and scutellum green-gray pollinose, the former with fuscous stripes, sometimes the latter yellow at the tip; pleurae and venter yellow pollinose with the usual fuscous stripes. Dorsum of abdomen yellow with four complete black longitudinal stripes; the apical segments black with yellow hind margins. Venter of abdomen yellow; usually a black quadrate spot on each of segments III to V; remaining segments black with yellow hind margins; the usual lateral streaks present. Halteres fuscous. Wings as figured; the apex of

the hyaline triangle attains vein R_{2+3} , and its base is of variable width. Legs yellow; apex of front tibiae and entire tarsi; basal portions of middle and hind femora, apex of hind tibiae. apical segments of middle and hind tarsi, black. Male: Like the female except for sex characters and more pronounced melanism. The palpi are darker. The black abdominal stripes are broader; the median spots on the venter are coalesced, thus forming a broad stripe which tapers toward the base. Cell 2d M of the wings infuscated for about one half its length, the brown color tapering along vein Cu to the end of the cell; cell Cu_1 infuscated except for a hyaline spot at its apex; cell 1st A infuscated along its upper margin, the brown color following vein Cu and Cu_2 to the posterior margin of the wing; anal area dilutely infuscated. Legs like the female except the posterior femora and tibiae which are yellow only at their apex and base respectively.

Comparative Notes. A more variable species than its close relative *C. pikei* Whit. from which it is at once separated by the complete lateral abdominal stripes. From *C. beameri* n. sp. *C. sequax* may be distinguished by its frontal callus which is usually black, and the apex of the hyaline triangle of the wing not exceeding vein R_{2+3} . See under description of *C. beameri*.

Type Data. Described from four females and one male from Western Kansas. One female and the male remain in the Francis Huntington Snow Entomological Collection of the University of Kansas.

Distributional Data:

UNITED STATES: Massachusetts 1, Aug. 6; New Jersey 4, July 16-Sept. 8; Virginia 2, Aug. 28-Sept. 9; North Carolina 3, July 25-Sept. 5; South Carolina 1, Aug. 18; Georgia 2, July 27; Ohio 1, July 24; Indiana 1, July 27; Illinois 6, July 10-Sept. 1; Minnesota 1, Aug. 5; Iowa 1; South Dakota 1; Kansas 15, July 5-Aug. 26; Oklahoma 1, Aug. 19; Colorado 1, Aug. 17-19.

In addition, reported by others from:

UNITED STATES: Maryland, Arkansas, Louisiana, Nebraska.

Chrysops shermani Hine (1907)

(Plate XXXII, fig. 38)

1907. *C. shermani* Hine, Ohio Nat., VIII, 229.

1926. *C. shermani* Kröber, Stett. Ent. Ztg., LXXXVII, 347.

Color. Black and yellow; abdominal pattern more or less vittate; the dilute crossband of the wings interrupted with hyaline where it crosses the veins.

Size. Length, 8 mm. to 10 mm.

Structural and Color Characters. Female: Vertex, frons and sides of genae yellow pollinose; frontal callus orange-yellow, bordered above with brown which continues as a line to the fuscous ocellar area; frontoelypeus, oral margins of genae, and palpi orange-yellow. Antennae slender; scape yellow, reddish near the apex; pedicel and base of black flagellum red-brown. Dorsum of thorax and scutellum black, the former with gray-yellow pollinose stripes; pleurae and venter yellow pollinose with the usual fuscous stripes. Dorsum of abdomen yellow; a large quadrate black spot beneath the scutellum practically coalescing with a parallel-sided black geminate spot on the second segment, on each side of which is a narrow black vittate spot not attaining the anterior margin; segments III to V each with four black vittate spots which do not attain the posterior margins; remaining segments black with yellow hind margins; the spots on segment V are usually so close so that it has the aspect of the apical segments. Venter yellow; a small fuscous median spot on each of segments III to V; remaining segments black with yellow hind margins; the usual black lateral streaks, not quite attaining the base. Halteres fuscous. Wings as figured; the crossband dilute, interrupted with hyaline where it crosses the veins, not reaching the posterior margin; stigma saturate brown; apical spot nearly separated from the crossband, dilute, also interrupted by hyaline along the veins. Legs yellow; the joints, apical portion of front tibiae and entire tarsi, base of hind femora and apex of tibiae, apical four middle and hind tarsal segments, black. Male: This sex has never been reported.

Comparative Notes. *C. shermani* is distinct from all other North American species by virtue of its unique wing pattern. The abdominal pattern is somewhat like that of *C. montana* O. S.

Type Data. Cotypes, five females from Highlands, North Carolina, July, 1907, one female, same locality, July 5, 1906; one female, Hayden, Ontario, July 10, 1906. In the Ohio State Museum, Columbus, Ohio. One cotype female in the Museum of Comparative Zoölogy, Cambridge, Massachusetts (C. W. Johnson Collection).

Distributional Data:

CANADA: Ontario: Hayden, July 30, 1906; Algonquin Park, July 28-31, 1916; Brule Lake, Aug. 2, 1911.

UNITED STATES: North Carolina: Highlands, July 5, 1906, July, 1907. Michigan: Cheboygan Co., July 11, 1931; Marquette Co., July 15, 1919; Dickinson Co., July 16, 1909.

Chrysops sordida Osten Sacken (1875)

(Plate XXX, fig. 15)

1875. *C. sordidus* Osten Sacken, Prodrôme I, 376.1926. *C. sordidus* Kröber, Stett. Ent. Ztg., LXXXVII, 249.

Color. Black, abdominal tergites with gray hind margins, the first two encroached upon on each side by a small gray-yellow spot.

Size. Length, 8 mm. to 10 mm.

Structural and Color Characters. Female: Vertex gray pollinose; frons, a mid-streak on the frontoclypeus, and sides of genae yellowish pollinose; frontal callus, frontoclypeus, oral margins of genae, and palpi, fuscous to black. Antennae fuscous; the scape except its extreme apex, yellow. Dorsum of thorax and scutellum black with yellowish pubescence, the former with faint gray pollinose stripes; pleurae and venter fuscous with a gray pruinosity, the former with yellow pile. Dorsum of abdomen black; a small gray-yellow spot on each side near the base; all segments caudad from II with rather conspicuous gray hind margins which on segments II to IV expand into median triangles. Venter black; the segments with narrow pale hind margins. Halteres fuscous. Wings as figured; often a narrow trace of an apical spot present. Legs black; the middle and hind metatarsi dark brown. Male: Unknown.

Comparative Notes. Separated from *C. excitans* Walker by the gray hind margins of the abdominal tergites and the smaller extent of the pale spot on each side of tergites I and II. From *C. cuculx* Whit. *C. sordida* is readily distinguished by the more saturate wing picture and again by the gray hind margins of the abdominal tergites.

Type Data. Described from nine females from the White Mountains, New Hampshire. I have studied the types, in the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

CANADA: Newfoundland: Little River, July 15, 1905.

UNITED STATES: New Hampshire: White Mountains. New York: Cranberry Lake, June 9-20, 1919; Essex Co., July 22, 1920.

In addition, reported by others from:

CANADA: Labrador.

UNITED STATES: Maine.

Chrysops striata Osten Sacken (1875)

(Plate XXXII, fig. 39)

1875. *C. striatus* Osten Sacken, Prodrome I, 391.
1903. *C. striatus* Hine, Ohio St. Acad. Spec. Pap. No. 5, 43.
1906. *C. striatus* Daecke, Ent. News, XVII, 41.
1907. *C. striatus* Daecke, Ent. News, XVIII, 141.
1918. *C. striatus* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 198.
1925. *C. striatus* Hine, Occ. Pap. Mus. Zool. Univ. Mich., No. 162, 20.
1925. *C. striatus* Kröber, Konowia, IV, 331.
1926. *C. striatus* Kröber, Stett. Ent. Ztg., LXXXVII, 343.
1930. *C. striatus* Stone, Ann. Ent. Soc. Am., XXIII, 287.
1931. *C. striatus* Philip, Minn. Tech. Bull., LXXX, 92.

Color. Black and yellow; abdominal pattern vittate.

Size. Length, 7 mm. to 9.5 mm.

Structural and Color Characters. Female: Vertex, frons, and sides of genae, yellow pollinose; frontal callus variable, black to yellow; frontoclypeus, oral margins of genae, and palpi, yellow; sometimes the frontoclypeus with a small black spot on each side. Antennae slender, variable in color; sometimes yellow with only the apex of the flagellum black; or sometimes the scape and pedicel red-brown, especially on their outer surfaces. Dorsum of thorax and scutellum plumbeus in ground color, the former with the usual fuscous stripes, the latter often yellow at the tip; pleurae gray-yellow pollinose with fuscous stripes. Dorsum of abdomen yellow; typically with four black longitudinal stripes, the median pair broader, the lateral ones not always reaching the base; these stripes are often broken by the yellow margins of the segments; the two apical segments black with yellow hind margins; in some specimens the median stripes so converge on the second segment that they form a sort of geminate figure. Venter of abdomen variable; usually yellow at the base; the black of the apical segments extending toward the base as a broad midstripe; lateral streaks present. Halteres fuscous. Wings as figured. Legs yellow; trochanters, apical portion of front tibiae and entire tarsi, bases of middle and hind femora, apex of hind tibiae, apical segments of middle and hind tarsi, black. Male: Like the female but that cell 2d M of the wings is infuscated except for a small hyaline area near the apex, cubital and anal regions dilutely infuscated. The median stripes of the abdominal dorsum are broader than in the female, usually coming together near the anterior margin of the second segment. The median stripe of the abdominal venter practically attains the base.

Comparative Notes. The species is so variable that separation is often difficult. Its closest relative is *C. vittata* Wied., from which

it is most readily distinguished by the plumbeous ground color of the thoracic dorsum and scutellum. Philip (1931) states that the thoracic stripes may vary from greenish-gray to a yellow not much different from that of *C. vittata*.

Remarks. Philip (1931) has given an excellent account of the variability of *C. striata*. His material consisted of over two hundred and fifty specimens.

Type Data. Described from several females from the District of Columbia and Illinois. In the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

UNITED STATES: Massachusetts 2, July 3 - Aug. 9; New York 4, July 1-26; New Jersey 1, July 3; Pennsylvania 1, June 26; Michigan 4, July 10 - Sept. 7; Ohio 8, June 10 - Aug. 14; Indiana 1, July 10 - Aug. 23; Wisconsin 2, June 24 - July 10; Illinois 3, July 5-15; Minnesota 5, July 20 - Aug. 7.

In addition, reported by others from:

CANADA: Quebec, Ontario.

UNITED STATES: Maine, New Hampshire, Maryland, District of Columbia, Virginia, Louisiana.

Chrysops surda Osten Sacken (1877)

(Plate XXXI, fig. 27)

1877. *C. surdus* Osten Sacken, West. Dipt., p. 223.

1887. *C. surdus* Williston, Trans. Kans. Acad. Sci., X, 134.

1904. *C. surdus* Hine, Ohio Nat., V, 226.

1926. *C. surdus* Kröber, Stett. Ent. Ztg., LXXXVII, 322.

Color. Predominantly black; abdominal pattern with some yellow.

Size. Length, 6.5 mm.

Structural and Color Characters. Female: Vertex gray pollinose; frons and sides of genae yellow pollinose; ocellar area, frontal callus, a line connecting them, frontoclypeus (except a denuded brown-yellow mid-streak), oral margins of genae, and palpi, fuscous to black. Antennae fuscous; basal segments brown-yellow, red-brown, or sometimes fuscous, especially on the outer surfaces. Thoracic dorsum and scutellum black, the former with gray pollinose stripes; pleurae and venter gray pollinose with the usual black stripes. Dorsum of abdomen predominantly black; first segment yellow with a large quadrate black spot beneath the scutellum practically attaining a heavy black median geminate figure on the second segment, on each side of which is a small black spot; sometimes an anterolateral black spot is apparent on the first segment;

segments III and IV black, narrowly incised in the center by the yellow of the hind margins; remaining segments black with yellow hind margins. Venter black; the segments with yellow hind margins; first three or four segments yellow, each with a large black median spot becoming successively broader caudad; broad black lateral stripes present, practically attaining the base. Wings as figured. Halteres black. Legs black; extreme base of front tibiae, apex of middle femora, basal portion or all of middle tibiae, middle and hind metatarsi, brown-yellow. Male: Like the female except for sex characters; exhibiting more melanism. Cell 2d M of the wings considerably infuscated. The black of the first two abdominal tergites more extensive than in the female.

Comparative Notes. Separated from *C. proclivis* O. S. by the black frontoclypeus with only a narrow yellow mid-streak, the dominantly black legs, and generally smaller size.

Type Data. Described from four females, Webber Lake, Sierra county, California, July 21. In the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

UNITED STATES: Oregon: Mt. Hood. California: Giant Forest, July 28, 1929; Tahoe, June 19, 1927; Plumas Co., July 20-22, 1916; Fallen Leaf, July 16, 1917; Shasta Co. Nevada: Ormsby Co., July 6.

In addition, reported by others from:

CANADA: British Columbia.

UNITED STATES: Washington.

Chrysops ultima Whitney (1914)

(Plate XXXIII, fig. 53)

1914. *C. ultimus* Whitney, Can. Ent., XLVI, 345.

1926. *C. ultimus* Kröber, Stett. Ent. Ztg., LXXXVII, 320.

Color. Fuscous.

Size. Length, 8 mm.

Structural and Color Characters. Female: Vertex, frons and sides of genae, gray to gray-yellow pollinose; ocellar area, frontal callus, a line connecting them, a spot on each side of the yellow frontoclypeus, oral margins of genae, and palpi, fuscous. Antennae slender; scape yellow, pedicel and base of flagellum brown-yellow, apex of flagellum, black. Dorsum of thorax and scutellum fuscous, the former with faint gray pollinose stripes, most pronounced anteriorly; pleurae and venter gray pollinose with the usual fuscous stripes. Abdomen fuscous, a very faint grayish middorsal stripe

sometimes apparent. Halteres fuscous. Wings as figured; the hyaline triangle narrow and open to R_{2+3} . Legs yellow; the joints, apical portion of front tibiae and entire tarsi, bases of middle and hind femora, apex of hind tibiae, apical segments of middle and hind tarsi, fuscous. Male: Unknown.

Comparative Notes. To be separated from its very close relatives according to the key. Wing picture like *C. obsoleta* Wied.; abdomen more like *C. parvula* Daecke and *C. lugens* Wied.

Remarks. I have seen but a few specimens of this species. I doubt its validity, but I have not sufficient evidence to support my belief.

Type Data. Described from West Palm Beach, Florida. One female (the head missing) in the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

UNITED STATES: New York 1, Aug. 20-30; New Jersey 3, July 29 - Aug. 28; Maryland 1, June 26; North Carolina 1, May 16; Florida 4, March - April 6.

Chrysops univittata Macquart (1855)

(Plate XXXIII, fig. 56)

1855. *C. univittatus* Macquart, Dipt. Exot., Suppl., V, 36.

1875. *C. univittatus* Osten Sacken, Prodrôme I, 387.

1903. *C. univittatus* Hine, Ohio St. Acad. Spec. Pap. No. 5, 44.

1906. *C. univittatus* Daecke, Ent. News, XVII, 41.

1907. *C. univittatus* Daecke, Ent. News, XVIII, 141.

1907. *C. univittatus* Hine, Bull. 93, La. Exp. Sta., p. 34.

1918. *C. univittatus* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 198.

1926. *C. univittatus* Kröber, Stett. Ent. Ztg., LXXXVII, 335.

1931. *C. univittatus* Philip, Minn. Tech. Bull., LXXX, 93.

Color. Black and yellow; abdominal pattern vittate, with a broad yellow median stripe.

Size. Length, 6 mm. to 8.5 mm.

Structural and Color Characters. Female: Vertex gray-yellow pollinose; frons and sides of genae yellow pollinose; frontal callus and a spot on each side of the frontoclypeus, fuscous; frontoclypeus, oral margins of genae, and palpi, yellow. Scape of antenna yellow; pedicel and base of flagellum brown-yellow; remainder of flagellum black. Thoracic dorsum gray pollinose with narrow fuscous stripes; scutellum fuscous, sometimes yellow except on the disc; pleurae and venter gray-yellow pollinose with the usual fuscous stripes. Dorsum of abdomen with a conspicuous yellow median stripe enclosed between two fuscous stripes whose outer sides are irregular in outline; lateral margins yellow; apical two segments usually en-

tirely fuscous. Venter of abdomen yellow; the black of the apical segments extends toward the base as a broad median stripe; black lateral streaks present. Wings as figured; the apical spot very broad. Legs yellow; the trochanters, apical portion of front tibiae and entire tarsi, apical segments of middle and posterior tarsi, black; sometimes the base of the hind femora, black. Male: Very similar to the female; the infuscation of cell 2d M more extensive; the black of the median abdominal stripes more nearly reaching the lateral margins.

Comparative Notes. Separated from *C. moecha* O. S. by the greater extent of the hyaline triangle of the wing and by the two fuscous abdominal stripes instead of four. See, also, under description of *C. moecha*.

Type Data. Described from female specimens from Baltimore, Maryland. In the Museum of Lille.

Distributional Data:

UNITED STATES: Maine 1, July 6-9; New Hampshire 2, July 16; Massachusetts 4, June 25 - July 16; Connecticut 2, June 22 - July 2; New York 5, June 23 - Aug. 23; New Jersey 6, June 21 - July 4; Delaware 1, June 29; Maryland 12, June 6 - Aug. 8; District of Columbia 1, June 14; Virginia 8, May 31 - Sept. 1; North Carolina 1, Aug. 13; Georgia; Pennsylvania 6, June 5 - July 20; Michigan 3; Ohio 20, June 2 - Aug. 27; Indiana 1, July 12; Illinois 3, July 10-17; Kansas.

In addition, reported by others from:

CANADA: Quebec.

UNITED STATES: Florida, Wisconsin, Minnesota, Louisiana.

Chrysops virgulata Bellardi (1861)

(Plate XXXIV, fig. 71; Plate XXXV, fig. 88)

1861. *C. virgulatus* Bellardi, Saggio I, 71, pl. II, f. 17.

1901. *C. virgulatus* Williston, Biologia, Dipt. 1, 255.

1904. *C. virgulatus* Hine, Ohio Nat., V, 226.

1925. *C. virgulatus* Kröber, Konowia, IV, 235.

1926. *C. virgulatus* Kröber, Stett. Ent. Ztg., LXXXVII, 256.

The following also refer to this species:

1850. *C. geminatus* Macquart (nec Wied.), Dipt. Exot., Suppl. IV, 39.

1884. *C. crassicornis* Van der Wulp, Wien., Ent. Ztg., III, 141.

Color. Fulvous with black abdominal pattern.

Size. Length, 7 mm. to 8 mm.

Structural and Color Characters. Female: Vertex broader than long, gray-yellow pollinose; frons, sides of genae, and a mid-streak on the frontoclypeus, yellowish pollinose; upper margin of frontal callus and a small spot on each side of the oral margins of the

genae, fuscous; frontal callus, remainder of genae and palpi, yellow. Antennae strongly incrassate, the annulate portion of the flagellum shorter than the basal segment; wholly yellow or brown-yellow except the black apex of the flagellum. Dorsum of thorax and scutellum fulvous pollinose, the former with faint brown stripes; pleurae and venter fulvous pollinose with the usual brown regions. Abdominal dorsum fulvous; a quadrate black spot beneath the scutellum, posteriorly emarginate, sometimes expanding anterolaterally; segments II to IV each with a heavy double geminate black figure the outer portions of which are narrowly lunate; remaining segments mostly black with yellow hind margins; sometimes the pattern on the fifth segment corresponds to those preceding. Venter of abdomen fulvous; the black of the apical segments produced basally as a median stripe; the black lateral stripes attain the base. Halteres yellow. Wings as figured. Legs yellow; the joints, apical portion of front tibiae and entire tarsi, apical segments of middle and hind tarsi, black. Male: Easily associated with the female, but much darker. The palpi and antennae are yellow-brown. Dorsum of thorax and scutellum with fuscous ground color. Abdomen like the female, except the black is more extensive, the first tergite being entirely black except for the narrow posterolateral angles. Wings like the female except that the infuscation of cell 2d M is equal to that of cell R and cell 1st A is more extensively infuscated. Legs generally darker.

Comparative Notes. Easily distinguished from related species with the broad vertex and swollen antennae by the very short annulate portion of the flagellum. The abdominal pattern is much like that of *C. robusta* n. sp.

Remarks. This is the first time that *C. virgulata* has been reported north of Mexico.

Type Data. Described from a male specimen, Cuautla, Mexico; from Saussure's Collection. Probably in the Museum of Turin.

Distributional Data:

UNITED STATES: Texas: Kingsville, June 8, 1921; Del Rio, May 27, 1912. Arizona: Douglas, Aug.; San Bernardino Ranch.

MEXICO: Jalisco: Guadalajara, June 18, 1903, July 21, 1903, Aug. 8, 1903.

In addition, reported by others from:

MEXICO: Guerrero: Guanajuata, Colima.

Chrysops vittata Wiedemann (1821)

(Plate XXXII, fig. 42; Plate XXXV, fig. 82)

1821. *C. vittatus* Wiedemann, Dipt. Exot., 106.
 1828. *C. vittatus* Wiedemann, Auss. Zw., I, 200.
 1855. *C. vittatus* Macquart, Dipt. Exot., Suppl. V, 37.
 1875. *C. vittatus* Osten Sacken, Prodrôme I, 390.
 1895. *C. vittatus* Townsend, Trans. Amer. Ent. Soc., XXII, 57.
 1895. *C. vittatus* Hart, Bull. Ill. State Lab. N. H., IV, 228. (Larva and pupa.)
 1902. *C. vittatus* Howard, Ins. Book, pl. XV, f. 37.
 1903. *C. vittatus* Hine, Ohio St. Acad. Sci. Spec. Pap. No. 5, 44.
 1906. *C. vittatus* Daecke, Ent. News, XVII, 41.
 1907. *C. vittatus* Daecke, Ent. News, XVIII, 141.
 1907. *C. vittatus* Hine, Bull. 93, La. Exp. Sta., p. 35.
 1918. *C. vittatus* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 198.
 1920. *C. vittatus* Marchand, Mon. Rock. Inst., No. 13, p. 52.
 1924. *C. vittatus* Wehr, Neb. Univ. Studies, XXII, 113.
 1926. *C. vittatus* Kröber, Stett. Ent. Ztg., LXXXVII, 339.
 1930. *C. vittatus* Schwardt and Hall, Bull. 256, Ark. Exp. Sta., f. 2.
 1930. *C. vittatus* Stone, Ann. Ent. Soc. Am., XXIII, 288.
 1931. *C. vittatus* Schwardt, Jl. Kans. Ent. Soc., IV, 9.
 1931. *C. vittatus* Philip, Minn. Tech. Bull., LXXX, 94.

The following also refer to this species:

1848. *C. areolatus* Walker, List I, 197.
 1867. *C. lineatus* Jeannicke, Neue Exot. Dipt., p. 26.

Color. Yellow; dorsum of abdomen with four black stripes.

Size. Length, 6.5 mm. to 10 mm.

Structural and Color Characters. Female: Vertex, frons, and sides of genae yellow pollinose; frontal callus, frontoclypeus, genae, and palpi, yellow. Antennae slender, yellow, except the black apical portion of the flagellum. Dorsum of thorax and scutellum yellow, the former with fuscous stripes; pleurae and venter yellow with the usual fuscous stripes. Dorsum of abdomen yellow with four black longitudinal stripes; the median pair usually, but not always, complete, the lateral ones usually incomplete. Venter of abdomen yellow; the black of the apical segments may or may not extend part way to the base as a median stripe; the usual lateral streaks present. Halteres fuscous. Wings as figured; the fuscous streak extending from the distal margin of the crossband into cell R_5 not always present. Legs yellow; apex of front tibiae and entire tarsi, middle and hind coxae and trochanters, apical three or four segments of the middle and hind tarsi, fuscous. Male: Similar to the female except for sex characters and a greater extent of infuscation in cell 2d M of the wing. The sexes are very readily associated.

Comparative Notes. Exhibits more yellow than its closest relative *C. striata* O. S. The yellow frontal callus, yellow ground color of the thorax, wholly yellow scutellum, and predominantly yellow

legs offer the best characteristics for separation. See, also, under description of *C. striata*.

Type Data. In the Museum of Vienna. Kröber (1926) states that no specimen is designated as the type.

Distributional Data:

CANADA: Quebec 1, July 1.

UNITED STATES: Maine 3, June 9 - Aug. 10; New Hampshire 3, July 4-16; Massachusetts 5, July 16 - July 24; Rhode Island 1, July 28; Connecticut 3, June 24 - July 25; New York 8, June - Aug. 14; New Jersey 4, June 28 - Aug. 15; Delaware 2, June 29 - Aug. 3; Maryland 14, June 23 - Sept. 23; District of Columbia 2, Aug. 7-19; Virginia 10, June 12 - Aug. 29; North Carolina; South Carolina 1, Aug. 24; Georgia 3, July 10 - Aug. 22; Florida 2, June 1 - Aug. 17; Pennsylvania 7, June 4 - Aug. 22; Michigan 4, June 1 - Aug.; Ohio 16, June 11 - Aug. 28; Indiana 1, July 1 - Aug. 7; Alabama 2, July 21-22; Wisconsin; Illinois 3, July 8-26; Mississippi 4, July 14-17; Minnesota; Iowa 1; Missouri 1; Arkansas 1, June 29; Louisiana 2, June 9-29; Kansas 2, July 9 - Sept. 4.

In addition, reported by others from:

CANADA: Ontario.

United States: Nebraska.

Chrysops vittata floridana Johnson (1913)

(Plate. XXXII, fig. 43)

1913. *C. vittatus floridanus* Johnson, Bull. Am. Mus. N. H., XXXII, 52.

1926. *C. vittatus floridanus* Kröber, Stett. Ent. Ztg., LXXXVII, 341.

Color. Yellow; abdominal stripes obscure.

Size. Length, 9 mm.

Structural and Color Characters. Female: General aspect of *C. vittata* Wied. The thoracic stripes are light brown, the abdominal stripes more obsolete. Wings as figured; the infuscation more extensive than in *C. vittata*, especially the apical spot. Legs like *C. vittata*. Male: This sex has not been reported.

Type Data. In the Museum of Comparative Zoölogy, Cambridge, Massachusetts. I have studied the types.

Distributional Data:

UNITED STATES: Virginia: Hickory, July 3, 1903. Georgia. Florida: Alachua Co., May 31, 1925, Sept. 15, 1923; Hillsboro Co., March 23, 1925; Horse Landing, May 17, 1894; St. John's River, May 7-17, 1924; Pasco Co., April 22, 1930; Putnam Co.

Chrysops wiedemanni Kröber (1926)

(Plate XXXIII, fig. 52)

1926. *C. wiedemanni* Kröber, Stett. Ent. Ztg. LXXXVII, 267 (new name for *C. obsoletus* of authors, nec Wied.).

1930. *C. wiedemanni* Stone, Ann. Ent. Soc. Am., XXIII, 290.

1931. *C. wiedemanni* Philip, Minn. Tech. Bull., LXXX, 94.

The following also refers to this species:

- 1875. *C. obsoletus* Osten Sacken, Prodrome I, 393.
- 1903. *C. obsoletus* Hine, Ohio St. Acad. Spec. Pap. No. 5, 42.
- 1906. *C. obsoletus* Daecke, Ent. News, XVII, 38.
- 1907. *C. obsoletus* Daecke, Ent. News, XVIII, 144.
- 1907. *C. obsoletus* Hine, Bull. 93, La. Exp. Sta., p. 32.
- 1918. *C. obsoletus* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 197.
- 1924. *C. obsoletus* Wehr, Neb. Univ. Studies, XXII, 112.
- 1930. *C. obsoletus* Schwardt and Hall, Bull. 256, Ark. Exp. Sta., p. 13.
- 1931. *C. obsoletus* Schwardt, Jl. Kans. Ent. Soc., IV, 8.
- 1926. *C. fraternus* Krüger, Stett. Ent. Ztg., LXXXVII.

Color. Fuscous; dorsum of abdomen typically with a yellow median stripe.

Size. Length, 6.5 mm. to 8 mm.

Structural and Color Characters. Female: Vertex gray pollinose; frons and sides of genae yellowish pollinose; frontal callus, a spot on each side of the frontoclypeus, another on the oral margins of the genae, and palpi, fuscous to black; remainder of frontoclypeus and genae, yellow. Scape of antenna yellow; pedicel and base of flagellum brown-yellow; apical portion of flagellum black. Dorsum of thorax and scutellum plumbeus, the former with fuscous stripes, sometimes the latter yellow at the tip; pleurae and venter yellow pollinose with the usual fuscous stripes. Dorsum of abdomen fuscous with a conspicuous yellow median stripe; in one specimen also a yellow lateral stripe on each side. Venter variable; usually yellow with a broad fuscous median stripe extending basally from the fuscous apical segments, and the usual lateral streaks; sometimes the venter is almost entirely fuscous except for some yellow on the sides near the base. Halteres fuscous. Wings as figured; cell R hyaline, the apical spot nearly disconnected from the crossband, and the hyaline triangle broadly open posteriorly. Legs yellow; the trochanters, apical portion of front tibiae and entire tarsi, base of hind femora and sometimes the apex of the tibiae, apical segments of middle and hind tarsi, black. Male: Differs from the female by the usual sex characters and by cell R being infuscated. The head is proportionately large.

Comparative Notes. *C. wiedemanni* is a distinct North American species. It has for many years been identified as *C. obsoleta* Wied., but is readily separated by the wing picture. In the female cell R is hyaline, in both sexes, the apical spot is narrowly joined to the crossband and usually extends but a little way into cell R₄, consequently the hyaline triangle is broadly open.

Remarks. The males (identified from reared specimens by Dr. H. H. Schwardt at the University of Arkansas) conform in all re-

spects to Kröber's description of *C. fraterna*. It is quite evident that the infuscated cell R of this sex should make the association with the female improbable. I have not seen Kröber's type, but undoubtedly it is the same as his *C. wiedemanni*.

Type Data. Through the courtesy of the Museum of Vienna I received one type female for study. The specimen had been previously determined (by Wiedemann?) as *C. obsoletus*. From "Pennsylvanien, Coll. Winthem."

Distributional Data:

UNITED STATES: Maine 1, July 6; Massachusetts; Connecticut 1, Aug. 12; New York 4, July 19 - Aug. 16; New Jersey 3, July 12 - Sept. 8; Delaware 1, Aug. 3; Maryland 5, June - Aug. 13; District of Columbia 1, July 7; Virginia 3, July 13 - Aug. 1; North Carolina 1, July 10-17; South Carolina 1, Aug. 24; Georgia 2, July 25; Pennsylvania 3, July 6-19; Michigan 3, July 4-28; Ohio 8, June 13 - Aug. 1; Tennessee 1, July 10 - Aug. 31; Wisconsin 1, July 30; Illinois 3, July 10 - Aug. 12; Mississippi 4, July 14-17; Arkansas 3, April 16 (reared) Sept. 12.

In addition, reported by others from:

CANADA: Quebec, Ontario.

UNITED STATES: New Hampshire, Minnesota, Iowa, Louisiana, Nebraska.

Neochrysops Walton (1918)

1918. *Neochrysops* Walton, Proc. Ent. Soc. Wash., XX, 191.

Original Description. Hind tibiae bearing spurs; head much as in *Chrysops*, but antennae more slender; first joint subequal with the third which is but faintly swollen at base and bears five annuli; second segment slender and two thirds length of first. Eyes in life marked as in figure (four more or less triangular coalescent spots on the disc). Ocelli present, closely approximated; wings evenly infuscated throughout; anterior branch of third vein bearing a stump at its bend extending into second marginal cell; abdomen globose, much wider than thorax.

Genotype: *N. globosa* Walton (1918).

Remarks. *Neochrysops* is doubtfully a good genus. Bequaert (1930) includes it under *Chrysops*. There is so little evidence, insofar as there is but one specimen, that I prefer to let it stand as the original author intended.

Neochrysops globosa Walton (1918)

1918. *N. globosus* Walton, Proc. Ent. Soc. Wash., XX, 192.

Color. Yellow and black; abdominal dorsum with a double row of large black spots; wings uniformly infuscated.

Size. Length, 8 mm.

Structural and Color Characters. Female: Vertex, frons, an abbreviated mid-streak on the upper part of the frontoelypeus, and sides of genae, yellow pollinose; ocellar area, frontal callus, a large spot on each side of the yellowish frontoelypeus, another on the oral margins of the genae, black. Palpi yellow. Antennae very slender and elongate; the scape yellow, pedicel and base of flagellum brown-yellow, apical portion of flagellum black. Dorsum of thorax and scutellum yellow pollinose with pale yellowish pubescence, the former with three fuscous stripes, the median one extending part way onto the scutellum; pleurae and venter yellow pollinose with fuscous stripes, the former with sparse yellowish pile. Abdomen inflated, yellow, with black pubescence most dense at the lateral margins and the apex; the dorsum with a double row of more or less rounded large black spots beginning on the first segment, becoming on each succeeding segment somewhat smaller; venter wholly yellow. Halteres yellow. Wings uniformly infuscated, most saturate along the costal margin and the stigma; a stump at the bifurcation of vein R_{4+5} . Legs yellow; the trochanters, apices of tibiae, entire front tarsi, apical segments of middle and hind tarsi, black. Male: Unknown.

Comparative Notes. This species has close affinities with the genus *Chrysops*. It differs from the North American species of that genus by the wholly infuscated wings with a stump at the bifurcation of vein R_{4+5} , the inflated abdomen (Bequaert [1930] suggests that this condition may be due to the presence of a worm), the very long and slender antennae, and according to Walton (1918), the eye-marking consisting of four coalescent more or less diamond-shaped spots.

Type Data. Described from one female (up to now the only specimen represented in collections) from Cabin John Bridge, Maryland, July 20, 1916. In the United States National Museum.

Silvius Meigen (1820)

1820. *Silvius* Meigen, Syst. Beschreib. Europ. Zweifl. Ins., p. 27.

1922. *Perisilvius* Enderlein, Mitt. Zool. Mus. Berlin, X, 2, p. 344.

Generic Characters. Eyes bare, often with numerous brown spots, contiguous in the male, broadly separated in the female. Ocelli present. Frontal callus present in the female. Pedicel of antenna half or less the length of the scape; flagellum five segmented. Palpi a little more than half the length of the proboscis, which is a little shorter than the head.

Genotype: *Tabanus vituli* Fabricius (1805).

Remarks. All nearetic species of this genus are western in distribution.

KEY TO SPECIES

1. Wings maculate, species gray..... 2
Wings immaculate, species yellow..... 5
2. Costal cell infuscated..... *sayi* n. sp., p. 357
Costal cell not infuscated..... 3
3. Frontal callus distinctly more than half the width of vertex, narrowly separated from eyes *laticallus* n. sp., p. 353
Frontal callus about half the width of vertex, broadly separated from eyes..... 4
4. Veins R_4 and R_5 with subapical spots..... *quadrivittatus* (Say), p. 356
Veins R_4 and R_5 without subapical spots..... *pollinosus* Will., p. 355
5. Frontoclypeus entirely pruinose; abdominal tergites with conspicuous median triangles *microcephalus* Wehr., p. 354
Frontoclypeus partially denuded abdominal tergites without median triangles. *gigantulus* (Loew), p. 352

Silvius gigantulus (Loew) (1872)

(Plate XXXV, fig. 89)

1872. *Chrysops gigantulus* Loew, Cent., X, 12.
1877. *Silvius gigantulus* Osten Sacken, West. Dipt., p. 215.
1887. *S. gigantulus* Williston, Trans. Kans. Acad. Sci., X, 131.
1895. *S. gigantulus* Townsend, Proc. Cal. Acad. Sci., IV, 595.
1904. *S. gigantulus* Hine, Ohio Nat., V, 229.
1924. *S. gigantulus* Wehr, Neb. Univ. Studies, XXII, 110.

The following also refers to this species:

1875. *Silvius trifolium* Osten Sacken, Prodrome I, 395.

Color. Yellow.

Size. Length, 9 mm. to 11 mm.

Structural and Color Characters. Female: Vertex, frons, upper and lower limits of the yellow-brown frontoclypeus, and genae yellow pollinose; ocellar space more or less denuded, black; frontal callus subround or pear-shaped, shining black. Genae and post genae yellow pilose. Palpi tapering to a point, orange-yellow. Antennae variable as to color, typically orange-yellow except the black apical portion of the flagellum. Dorsum of thorax and scutellum fulvous pruinose with yellow pubescence; pleurae and venter gray pollinose, the former with dense yellow pile. Abdomen golden-yellow with black pubescence; usually a quadrate posteriorly emarginate black spot beneath the scutellum and an elongate black spot on the disc of the second tergite. Halteres yellow. Wings hyaline except the yellow costal cell and stigma; a stump at the bifurcation of vein R_{4+5} . Legs yellow; the trochanters, femoro-tibial joints, apex of front tibiae and entire tarsi, apices of middle and hind tarsi, fuscous. Male: Like the female except for sex characters, more densely pubescent and pilose, etc. The sexes are very easily associated.

Comparative Notes. Separated from *S. microcephalus* Wehr by the denuded areas on the frontoclypeus, the head larger in relation to the thorax, and the lack of middorsal triangles.

Remarks. There is at hand a series which I am sure belongs to this species, but the black spot of the first and second abdominal tergites is lacking, and in general the specimens are somewhat smaller. I do not feel that I have sufficient evidence to raise this form to varietal rank.

Type Data. Described from California. One female in the Museum of Comparative Zoölogy, Cambridge, Mass.

Distributional Data:

CANADA: British Columbia 5, July 15 - Aug. 10.

UNITED STATES: Washington 6, July 15 - Aug.; Oregon 1, July 27; California 14, May 27 - Aug. 23; Idaho 1; Montana 1, Aug. 11.

In addition, reported by others from:

UNITED STATES: Colorado, New Mexico, Nevada.

Silvius laticallus, new species

(Plate XXXVI, figs. 95, 101)

Color. Gray, with conspicuous black abdominal figures.

Size. Length, 7 mm. to 8 mm.

Structural and Color Characters. Female: Vertex, frons, frontoclypeus, and genae pale gray pollinose, the pits on the sides of the frontoclypeus denuded, brown; ocelli reddish; frontal callus broad, equal to at least three fourths the width of the vertex, shining black, a narrow line extending from the upper margin to the median ocellus. Palpi stout, dorsolaterally grooved, brown with grayish pollen; antennae mostly black, the basal segments with a grayish pruinosity, the extreme base of the scape and flagellum reddish. Dorsum of thorax and scutellum black, gray pruinose, the former with three narrow lighter gray pollinose stripes; pleurae and venter gray-black, pruinose, the former with white pile. Dorsum of abdomen gray; a broad quadrate black spot beneath the scutellum, posteriorly emarginate, not reaching the hind margin of the first segment; segments II to V each with a heavy black more or less double geminate figure whose inner portions are the broader and whose outer portions are more strongly divergent; the sixth segment more or less corresponds to the pattern on the preceding segments; the seventh segment blackish with the hind margin gray, venter of abdomen gray; a black lateral spot present or absent on each of segments V and VI. Halteres brown. Wings hyaline; the stigma

brown, and the bifurcation of vein R_{4+5} and the cross veins brown maculate. Legs brown-yellow; the trochanters, apices of femora and tibiae, and tarsi (only the apices of the middle and hind metatarsi), fuscous. Male: Similar to the female except for sex characters. Densely gray-white pilose. Dorsum of abdomen yellowish in ground color instead of the typical gray of the female, the black abdominal pattern as in the female.

Comparative Notes. Differs from other nearctic species of *Silvius* by the conspicuous dorsolateral grooves of the stout palpi and the broad frontal callus.

Type Data. Holotype, female, Hermiston, Oregon, July 9, 1922; A. L. Melander. Allotype, male, Los Angeles Co., California. Paratypes, one female, San Diego, California, May; E. P. Van Duzee; one female and one male, Los Angeles Co., California. In the Francis Huntington Snow Entomological Collection of the University of Kansas.

Silvius microcephalus Wehr (1924)

1924. *S. microcephalus* Wehr, Neb. Univ. Studies, XXII, 109.

Color. Yellow; abdominal dorsum with a median row of whitish triangles.

Size. Length, 9.5 mm. to 11 mm.

Structural and Color Characters. Female: Head small as compared to the thorax. Vertex, frons, frontoclypeus and genae yellow pollinose; only the pits on each side of the frontoclypeus denuded, yellow-brown; frontal callus subround, black. Palpi slender, orange-yellow; antennae yellow, except the black apical portion of the flagellum, the scape and pedicel black pubescent. Dorsum of thorax and scutellum fulvous pollinose; pleurae and venter yellow-gray pollinose, the former with short yellow pile. Abdomen yellow with black and some pale pubescence, the dorsum with a median row of large whitish triangles apparently placed upon a dark mid-stripe. Halteres yellow. Wings hyaline, except the yellow costal cell and stigma, bifurcation of vein R_{4+5} with a stump. Legs yellow; apices of tibiae femoro-tibial joints, front tarsi, apical portions of middle and hind tarsi, fuscous. Male: I have but one poorly preserved specimen at hand. It is undoubtedly the male of this species. Similar to the female except for sex characters, more densely pilose; the thoracic dorsum and scutellum more gray than fulvous. The wholly pollinosed frontoclypeus and genae along with the dorsal abdominal markings easily associate the sexes.

Comparative Notes. To be separated from *S. gigantulus* (Loew) according to the key. See, also, under description of that species. In general the yellow coloration of *S. microcephalus* is more pale than that of *S. gigantulus*, although this is by no means a safe character. Attempting to separate these two species by the size of the head in proportion to the body does not appear reliable.

Type Data. Described from two females, Ute Creek, Costilla county, Colorado, August 7, 1907. In the University of Nebraska Collection. My identification is based on a specimen labeled "Paratype," in the Ohio State Museum.

Distributional Data:

UNITED STATES: Colorado: Mountain Home Lake, Fort Garland, 8,300 ft., July 20-25, 1932; Riley, August, 1890.

Silvius pollinosus Williston (1880)

(Plate XXXVI, fig. 104)

1880. *S. pollinosus* Williston, Trans. Conn. Acad. A. and S., IV, 244.

1887. *S. pollinosus* Williston, Trans. Kans. Acad. Sci., X, 131.

1903. *S. pollinosus* Snow, Kans. Univ. Sci. Bull., II, 213.

1924. *S. pollinosus* Wehr, Neb. Univ. Studies, XXII, 110.

Color. Gray pollinose; black abdominal spots obscure; wings spotted.

Size. Length, 9 mm. to 10.5 mm.

Structural and Color Characters. Female: Vertex, frons, frontoclypeus, and genae pale gray pollinose; the black suboval frontal callus equals about one half the width of the vertex; the pit on each side of the frontoclypeus denuded, black. Palpi reddish, the outer surfaces with some black. Antennae mostly black; scape and pedicel sometimes reddish at their bases, grayish pruinose. Entire body pale-gray pollinose; the dorsum of the thorax striped rather faintly with alternate light and dark; the abdominal dorsum with an obscure double row of median black angulate spots most visible on segments II to IV. All pilosity and pubescence, white. Halteres black. Wings hyaline; the stigma brown, also brown spots at the cross veins and bifurcation of vein R_{4+5} . See figure. Legs yellow; the front coxae gray pollinose; the joints, apices of tibiae and front and middle femora, practically the entire hind femora, all the tarsi, except the yellow bases of the metatarsi, fuscous. Male: Differs from the female by being less heavily pollinosed, hence the dorsum of the thorax and scutellum more blackish. The black abdominal spots are more conspicuous; the sides of the abdo-

men near the base are yellowish. Wings like the female. Legs like the female, except that all the femora are fuscous. All pilosity and pubescence more dense than in the female.

Comparative Notes. The very heavy pruinosity of this species is quite characteristic. Separated from *S. laticallus* n. sp. by the abdominal pattern, smaller frontal callus, slender palpi, fuscous hind femora, etc. From *S. quadrivittatus* (Say), *S. pollinosus* is separated according to the key, and in addition, by its pollinosity, by the abdominal dorsum having two rows of black spots instead of four, its larger size, and in the male, the femora are entirely fuscous. Also see under description of *S. quadrivittatus*.

Type Data. Described from Western Kansas. One female (antennae and one wing missing, coloration good) in the Francis Huntington Snow Entomological Collection of the University of Kansas.

Distributional Data:

UNITED STATES: South Dakota 3, June 19 - July 9; Kansas 4, June - August; Oklahoma 1, Aug. 2; Colorado 2, July 2 - Sept. 22; New Mexico 2, June 22; Utah; Arizona 1, July 22.

In addition, reported by others from:

UNITED STATES: Nebraska.

Silvius quadrivittatus (Say) (1823)

(Plate XXXVI, fig. 103)

- 1823. *Chrysops quadrivittatus* Say, Jl. Acad. N. S. Phil., III, 33.
- 1828. *C. quadrivittatus* Wiedemann, Auss. Zw. I, 200.
- 1859. *C. quadrivittatus* Say, Comp. Works, II, 54.
- 1887. *Silvius quadrivittatus* Williston, Trans. Kans. Acad. Sci., X, 131.
- 1895. *S. quadrivittatus* Townsend, Trans. Am. Ent. Soc., XXII, 57.
- 1904. *S. quadrivittatus* Hine, Ohio Nat., V, 229.
- 1924. *S. quadrivittatus* Wehr, Neb. Univ. Studies, XXII, 110.
- 1931. *S. quadrivittatus* Philip, Minn. Tech. Bull., LXXX, 95.

The following also refers to this species:

- 1892. *Diachlorus notatus* Bigot, Mem. Soc. Zool. France, V, 223.

Color. Gray or yellow-gray; abdominal dorsum with four rows of spots; wings spotted.

Size. Length, 7 mm. to 10 mm.

Structural and Color Characters. Female: Vertex, frons, frontoclypeus and genae yellowish-gray pollinose; frontal callus black, one half the width of the vertex; the pit on each side of the frontoclypeus denuded, black. Palpi reddish with some black, especially on the outer surfaces. Antennae variable; sometimes mostly black except the reddish bases of the segments, sometimes mostly reddish or yellow, only the apex of the flagellum black. Dorsum of thorax

and scutellum yellow-gray pollinose, the former with alternate light and dark stripes; pleurae and venter gray pollinose. Dorsum of abdomen yellow-gray or gray pollinose with four rows of black vittate spots. Venter of abdomen gray with a faint suggestion of a dark broken median stripe and a lateral one. Halteres black. Wings hyaline; the stigma brown, and brown spots typically distributed according to the figure. Legs yellow; the front coxae grayish pollinose; the trochanters, apices of femora and tibiae, and the tarsi (except the yellow bases of the metatarsi), fuscous. Male: Similar to the female except for sex characters. The abdomen is more yellowish. The three rows of vittate spots on the venter are quite distinct.

Comparative Notes. Separated from related species according to the key. Also, see under description of *S. pollinosus* Will. In addition, in the male, the abdomen of *S. quadrivittatus* is considerably more yellow than in *S. pollinosus*.

Type Data. Described from near the Rocky Mountains. The types are destroyed.

Distributional Data:

UNITED STATES: South Dakota 3, July 21; Nebraska 1, July 10; Kansas 3, June; Oklahoma 3, June 26 - Aug. 16; Texas 3, June 3 - July 18; Montana 1, July 11; Wyoming; Colorado 2, July 9 - Aug. 12; New Mexico 5, June 10 - Aug. 7; Utah 2, June 28 - Aug. 13; Arizona 1, Aug.

In addition, reported by others from:

UNITED STATES: Minnesota, California.

Silvius sayi, new species

(Plate XXXVI, figs. 98, 102)

Color. Gray with maculate wings and abdomen.

Size. Length, 7 mm. to 8.5 mm.

Structural and Color Characters. Female: Vertex, frons, genae and frontoclypeus (except the denuded piceous pits on the sides of the latter), gray pollinose; ocelli reddish; frontal callus shining black, often a narrow line extending from its upper margin to the median ocellus. Antennae reddish except for the black annulate portion of the flagellum, the scape and pedicel with a grayish pruinosity; palpi reddish-brown with gray pruinosity. Dorsum of thorax and scutellum black gray pruinose, the former with the usual pale-gray pollinose stripes; pleurae and venter gray pollinose with sparse white pile. Dorsum of abdomen gray, a broad quadrate black spot beneath the scutellum, not attaining the hind margin of the first segment; segments II to V with a row of black geminate

figures (these are exhibited in varying degree dependent on the distribution of pollinosity), remaining segments black with gray hind margins. Venter of abdomen gray. Halteres brown. Wings hyaline except for the infuscated costal cell and maculate areas. Legs brown, basal portions of front and middle tibiae, and middle and hind metatarsi, yellow.

Comparative Notes. This is the only nearetic *Silvius* with maculate wings and infuscated costal cell, by which it is immediately separated from related forms (*S. laticallus* n. sp., *S. quadrivittatus* [Say] and *S. pollinosus* Will.).

Type Data. Holotype, female, Texas. Paratypes, two females, Texas; two females, Los Angeles Co., California; one female, San Diego, Texas, June 29, 1930, H. M. Smith. Holotype and three paratypes in the United States National Museum, catalog No. 50504; two paratypes in the Francis Huntington Snow Entomological Collection of the University of Kansas.

Esenbeckia Rondani (1864)

1864. *Esenbeckia* Rondani, Arch. Zool. Modena, III, 84.

Generic Characters. Eyes bare, contiguous in the male, narrowly separated in the female. Ocelli present. Frontal callus absent. Flagellum of antenna eight-segmented. Proboscis about as long as the head or slightly longer. Palpi about one third or more the length of the proboscis. Cell R_5 of the wings petiolate.

Genotype. *Silvius vulpes* Wiedemann (1828).

KEY TO SPECIES

1. Yellow brown; pile of head and thorax yellow; legs yellow; in the male no definite demarcation between the large and small facets of the eyes.

incisuralis (Say), p. 359

Gray brown; pile of head and thorax grayish white; legs brown; a distinct line marks the transition from large to small facets in the eyes of the male.

delta (Hine), p. 358

Esenbeckia delta (Hine) (1920)

1920. *Pangonia delta* Hine, Ohio Jl. Sci., XX, 313.

1925. *Pangonia delta* Hine, Occ. Pap. Mus. Zool. Mich., No. 162, 6.

The following also refers to this species:

1904. *Pangonia saussurei* Hine, Ohio Nat., V, 228.

Color. Gray brown (this apparent color produced by a whitish pruinosity on a light brown ground).

Size. Length, 16 mm.

Structural and Color Characters. Male: Frontal triangle, frontoclypeus and genae gray white pollinose; genae and postgenae white

pilose. Palpi yellow with black hairs. Antennae yellow, the two basal segments with black hairs, the pedicel about half the length of the scape. Thorax pale gray brown pruinose with white pubescence and pile in the usual places. Abdomen more or less uniformly gray-brown, the sides of the segments darker apically. Halteres light brown. Wings subhyaline with a light-brown tinge, more saturate in the costal regions; veins light brown; the bifurcation of vein R_{4+5} with a stump. Legs practically uniformly brown with black hairs except for the whitish pollinose front coxae, which are white pilose. Female: Not available for description. According to my notes, the sexes are easily associated.

Comparative Notes. Separated from *E. incisuralis* (Say) according to the key. In addition, the black hairs of the legs of *E. delta* and the yellow hairs of the legs of *E. incisuralis* offer good characters.

Remarks. My description is based on a homotype male.

Type Data. Two males and one female, Huachuca Mountains and Palmerlee, Arizona. In the Ohio State Museum, Columbus, Ohio.

Distributional Data:

UNITED STATES: Arizona: Huachuca Mts., Aug. 1, 1927; Chiricahua Mts., Aug. 3.

Esenbeckia incisuralis (Say) (1823)

(Plate XXIX, fig. 1; Plate XXXV, fig. 78)

1823. *Pangonia incisuralis* Say, Jl. Acad. N. S. Phil., III, 31.

P. incisuralis Say, Amer. Ent., pl. XXXIV.

1859. *P. incisuralis* Say, Comp. Works, I, 75.

1887. *P. incisuralis* Williston, Trans. Kans. Acad. Sci., X, 130.

The following also refer to this species:

1828. *P. incisa* Wiedemann, Auss. Zw. 1, 90.

1904. *P. incisa* Hine, Ohio Nat., V, 228.

Color. Fuscous and yellow, the former usually dominant.

Size. Length, 14 mm. to 16 mm.

Structural and Color Characters. Female: Vertex, frontoclypeus and genae fulvous pruinose. Palpi and antennae orange-yellow, the pedicel of the latter not more than half the length of the scape. Genae and postgenae yellow pilose. Dorsum of thorax and scutellum fuscous, yellow pubescent; pleurae and venter fuscous, yellow pilose. Dorsum of abdomen fuscous, the hind margins of all the segments and the sides of the first two, yellow, the yellow pubescence most dense on the hind margins; venter mostly fuscous, the segments with yellow hind margins. The yellow of the abdomen

is of variable extent, sometimes occupying considerably more than the sides of tergites I and II. Halteres brown-yellow. Wings subhyaline with a yellow tinge most saturate in the costal regions; veins yellow; a stump usually present at the bifurcation of vein R_{4+5} . Legs yellow with yellow hairs, the front coxae and basal portions of all femora fuscous. Male: Like the female except for the usual sex characters.

Comparative Notes. Separated from *E. delta* (Hine) according to the key.

Type Data. Described from "Arkansas." The types are destroyed.

Distributional Data:

UNITED STATES: Kansas: Chautauqua Co., Cowley Co., 1916. Oklahoma: Stillwater, June 20, 1932. Texas: Gurley, May 28, 1905. New Mexico: Van Houten Canyon, Aug. 1, 1914; Eagle Trail Mt., Aug. 9, 1914.

In addition, reported by others from:

UNITED STATES: Arkansas.

Stonemyia, new genus

Generic Characters. Head in lateral aspect, convex. Eyes bare or hairy, contiguous in the male, separated in the female. Ocelli present. Frontal callus absent in female. Vertex relatively narrow, sides parallel to inner angles of eyes. Flagellum of antenna eight-segmented. Proboscis of variable length, averaging about the length of the head. Palpi very slender, one third to one half the length of the proboscis. Cell R_5 of wing open.

Comparative Notes. In the new world fauna *Stonemyia* is perhaps most closely related to *Esenbeckia* Rond., but from this is readily separated by open cell R_5 . *Buplex* Austen (Pl. XXXVI, figs. 96, 99) of the old world is structurally akin to *Stonemyia* (Pl. XXXVI, figs. 94, 97) except that the palpi are not slender at the base and are dorsally grooved, and the inner margins of eyes not angulate.

Remarks. This genus, named in honor of Dr. Alan Stone, who suggested the possibilities whereby a logical new group could be set up, is established to receive a small number of species, all of long standing, but which have been shunted about from one genus to another seemingly in an aimless fashion. The genus to which these species have most recently been relegated is *Buplex* Austen, but this genus is confined solely to Africa. From the standpoint of geographical distribution alone it appears that the gap between *Buplex*

and *Stonemyia* is too wide to be reconciled. With this in addition to the structural characters already mentioned it should at once be apparent that there is a basis for erecting a new genus.

For the genotype I select Osten Sacken's *Pangonia tranquilla*.

KEY TO SPECIES

1. Eyes hairy, at least in male (*Pilinas*)..... 2
Eyes bare (*Stonemyia*)..... 3
2. Wings blackish *jonesi* (Cresson), p. 367
Wings yellowish *californica* (Bigot), p. 366
3. Yellow species (including antennae and legs)..... 4
Not yellow species..... 5
4. Pedicel more than half the length of the scape; the bifurcation of vein R_{4+5} without a stump..... *pigra* (O. S.), p. 362
Pedicel not more than half the length of the scape, usually less; the bifurcation of vein R_{4+5} with a stump..... *ruficornis* (Bigot), p. 364
5. Length of proboscis equals width of head; palpi black..... *fera* (Will.), p. 361
Length of proboscis noticeably less than width of head; palpi not black..... 6
6. All femora black; abdomen with yellowish pubescence..... *tranquilla* (O. S.), p. 365
All femora ferruginous; abdomen with grayish pubescence..... *rasa* (Loew), p. 363

Subgenus *Stonemyia* s. str.

In this group are included all species with eyes bare.

Stonemyia (Stonemyia) fera (Williston) (1887)

1887. *Pangonia fera* Williston, Trans. Kans. Acad. Sci., X, 130.

1904. *P. fera* Hine, Ohio Nat., V, 227.

1921. *Corizoneura fera* Surcouf, Gen. Ins., CLXXV, 134.

1924. *Buplex fera* Bequaert, Psyche, XXXI, 33.

Color. Predominantly fuscous; sides of abdomen brown-yellow, hind margins of tergites pale; antennae, palpi, and legs black.

Size. Length, 12 mm. to 13 mm.

Structural and Color Characters. Female: Vertex, frontoclypeus and genae yellow-gray pollinose. Antennae and palpi black. Proboscis black, its length equal to the width of the head. Genae and postgenae with dense yellowish pile. Dorsum of thorax and scutellum fuscous to black with a variable amount of gray pruinosity, the former with faint gray stripes; pleurae and venter gray pruinose, the former densely yellow pilose. Abdomen fuscous with black and pale pubescence; broadly brown-yellow on the sides, especially near the base; hind margins of the segments whitish. Sometimes the second and third tergites are practically entirely brown-yellow except for a very small black median spot; sometimes all of the segments of the venter are fuscous with pale hind margins, usually the second is predominantly brown-yellow, and often the third. Halteres black. Wings subhyaline; stigma brown, costal area yellow-

ish; usually no stump at the bifurcation of vein R_{4+5} . Legs black. Male: Like the female except the usual sex characters.

Comparative Notes. The long proboscis and black antennae, palpi and legs make this species readily recognized. Some forms of the eastern *S. tranquilla* (O.S.) bear striking similarities, but neither the palpi nor the legs are wholly black and the proboscis is not so long.

Type Data. Described from one male, Mt. Hood, Oregon. In the Francis Huntington Snow Entomological Collection of the University of Kansas.

Distributional Data:

UNITED STATES: Washington, July 22 - Oct. ?8; Oregon 1, July 18, California 3, July 16 - 28; Idaho 1, June 20.

In addition, reported by others from:

CANADA: British Columbia.

Stonemyia (Stonemyia) pigra (Osten Sacken) (1875)

1875. *Pangonia pigra* Osten Sacken, Prodrôme I, 367.

1918. *P. pigra* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 191.

1928. *Buplex pigra* Leonard, N. Y. State List, p. 754.

Color. Yellow.

Size. Length, 11 mm. to 12 mm.

Structural and Color Characters. Female: Vertex convex anteriorly, gray-yellow pollinose; frontoclypeus and genae gray-yellow pollinose. Antennae yellow, the pedicel more than half the length of the scape. Palpi slender, yellow. Proboscis shorter than the head. Thorax gray-yellow pollinose with whitish-yellow pubescence and pile. Abdomen brown-yellow; the hind margins of the segments appear lighter due to yellowish pubescence. Wings hyaline, except the yellow stigma and costal area; no stump at the bifurcation of vein R_{4+5} . Halteres brown-yellow. Legs uniformly brown-yellow. Male: Similar to the female in all respects except for sex characters and more dense pubescence and pilosity.

Comparative Notes. Separated from all other eastern species by its yellow color. From *S. ruficornis* (Big.), a western species, it is easily distinguished by the absence of a stump at the bifurcation of vein R_{4+5} and the pedicel being more than half as long as the scape.

Type Data. Described from two females and one male, Kentucky and New York. Two females in the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

UNITED STATES: New Jersey 1, July 12; Maryland 1, June 25; District of Columbia 1, June 14; Virginia 3, June 11 - July 2.

In addition, reported by others from:

UNITED STATES: New York, Kentucky.

Stonemyia (Stonemyia) rasa (Loew) (1869)

1869. *Pangonia rasa* Loew, Cnt., VIII, 7.

1875. *P. rasa* Osten Sacken, Prodrone 1, 366.

1887. *P. rasa* Williston, Trans. Kans. Acad. Sci., X, 130.

1901. *P. rasa* Hine, Ohio Nat., II, 169.

1903. *P. rasa* Hine, Ohio St. Acad. Sci. Spec. Pap. No. 5, 45.

1918. *P. rasa* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 191.

1924. *Buplex rasa* Bequaert, Psyche, XXXI, 33.

1931. *B. rasa* Philip, Minn. Tech. Bull., LXXX, 95.

The following also refers to this species:

?1905. *Pangonia tranquilla* Washburn, 10th Rept. State Ent. Mann., 79.

Color. Brown; hind margins of abdominal segments pale; pubescence and pilosity light gray.

Size. Length, 10.5 mm. to 14 mm.

Structural and Color Characters. Female: Vertex, frontoclypeus and genae pale-gray pollinose. Scape, pedicel and extreme base of flagellum yellow-brown or reddish, apical portion of flagellum fuscous. Palpi slender, yellow. Proboscis about equal to the length of the head, distinctly less than the width. Genae and post-genae gray-white pilose. Dorsum of thorax and scutellum brown with gray pruinosity, the former with alternate light and dark stripes; pleurae and venter gray pruinose, the former densely pale-gray pilose. Abdomen chestnut brown, light-gray pubescent, especially on the whitish hind margins of the segments. Halteres fuscous. Wings subhyaline; stigma brown and a suggestion of dilute yellow in the costal areas; no stump at the bifurcation of vein R_{4+5} . Legs ferruginous; the coxae and femora with white pile, the tibiae and tarsi with short black pubescence. Male: Somewhat darker than the female; the costal areas of the wings more distinctly yellow and the legs darker; in other respects, except for sex characters, very readily associated with the female.

Comparative Notes. Separated from *S. tranquilla* (O. S.) according to the key. In addition the palpi are more yellow, the costal cell of the wing more dilute yellow, and the general color chestnut brown as opposed to the fuscous and yellow-brown of *S. tranquilla*.

Type Data. Described from the female with Wisconsin as the type locality. In the Museum of Berlin.

Distributional Data:

CANADA: Quebec 1, July 1.

UNITED STATES: Massachusetts 2, Aug. 8-28; New Hampshire 1; Connecticut 2, Aug. 10-12; New York 3, June - Aug. 27; Maryland 1, Aug. 14; Ohio 4, Aug. 21-30; Illinois 1, July 24.

In addition, reported by others from:

UNITED STATES: Maine, New Jersey, Wisconsin.

Stonemyia (Stonemyia) ruficornis (Bigot) (1892)

1892. *Corizoneura ruficornis* Bigot, Mem. Soc. Zoöl. France, V, 615.

1904. *Pangonia ruficornis* Hine, Ohio Nat., V, 228.

1921. *Corizoneura ruficornis* Surcouf, Gen. Ins., CLXXV, 134.

Color. Yellow.

Size. Length, 12 mm. to 14 mm.

Structural and Color Characters. Female: Vertex concave anteriorly, yellow pollinose; frontoclypeus and genae yellow pollinose. Antennae yellow, the pedicel not more than half the length of the scape. Palpi attenuate, yellow. Proboscis less than the length of the head. Thorax gray-yellow pollinose with yellow pubescence and pilosity. Dorsum of abdomen brown-yellow; venter variable, usually yellow with the apical segments blackish with yellow hind margins. Halteres yellow. Wings hyaline, yellow along the costal areas; a stump at the bifurcation of vein R_{4+5} . Legs uniformly yellow. Male: Like the female except the usual sex characters and more dense pubescence and pilosity.

Comparative Notes. A distinct western species. Separated from *S. pigra* (O. S.) according to the key. Also see under description of that species. In addition *S. ruficornis* is somewhat larger and more slender and the anterior vertex is noticeably concave.

Type Data. Described from two males, California.

In the British Museum.

Distributional Data:

UNITED STATES: Wyoming: Yellowstone, August. California: Cuyamaca Lake, July 6, 1929; Los Angeles Co., May; Dulzura, June 14, 1917; Calaveras Co.; Palo Alto, July 27, 1891; Fredalba, July 21, 1912.

Stonemyia (Stonemyia) tranquilla (Osten Sacken) (1875)

(Plate XXXVI, figs. 94, 97)

1875. *Pangonia tranquilla* Osten Sacken, Prodrôme I, 367.1887. *P. tranquilla* Williston, Trans. Kans. Acad. Sci., X, 130.1902. *P. tranquilla* Howard, Ins. Book, pl. XVI, f. 7.1921. *Corizoneura tranquilla* Surcouf, Gen. Ins. CLXXV, 134.1924. *Buplex tranquilla* Bequaert, Psyche, XXXI, 33.1927. *B. tranquilla* Johnson, Ins. Mt. Des. Reg., p. 179.

Color. Yellow-brown; the abdomen more or less predominated with fuscous.

Size. Length, 10.5 mm. to 14.5 mm.

Structural and Color Characters. Female: Vertex, frontoclypeus and genae, yellow-gray pollinose. Genae and postgenae yellowish pilose. Palpi slender, ferruginous with a little fuscous showing through. Antennae black; sometimes the base of the flagellum reddish. Proboscis not usually longer than the head, always less than the width of the head. Dorsum of thorax and scutellum fuscous, gray pruinose, the former with alternate light and dark stripes; pleurae and venter gray pollinose, the former densely yellow pilose. Dorsum of abdomen yellow-brown on the sides, especially on tergites II and III, and sometimes IV; elsewhere fuscous, the tergites with yellowish hind margins. Venter of abdomen usually with segments II and III yellow-brown and the remaining segments fuscous with yellow hind margins. Entire abdomen yellow pubescent, especially the hind margins of the segments. Halteres fuscous. Wings subhyaline; the stigma brown and costal cells yellow; bifurcation of vein R_{4+5} without a stump. Legs black; the femoro-tibial joints and basal portions of tarsal segments, red-brown; sometimes the basal portion of the front tibiae and entire middle and hind tibiae red-brown. Male: Similar to the female except for sex characters and generally darker.

Comparative Notes. Separated from *S. rasa* (Loew) according to key characters. Also, see under description of *S. rasa*. In addition the antennae of *S. tranquilla* are almost entirely black and the proboscis frequently longer in proportion to the head.

Type Data. Described from one male and two females. Habitat given as Canada, Massachusetts, White Mountains and Middle States. The three type specimens are in the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Distributional Data:

UNITED STATES: Maine 3, July 25-Aug. 17; New Hampshire 5, August; Vermont 1, Aug. 15; Connecticut 1; New York 6, July 13-Aug. 12; Michigan 1, Aug. 4.

In addition, reported by others from:

CANADA: Nova Scotia, Quebec.

UNITED STATES: Pennsylvania.

Subgenus *Pilimas*, new subgenus

I have erected this subgenus to receive two species of hitherto uncertain generic status, with eyes hairy, at least in the male.

Stonemyia (Pilimas) californica (Bigot) (1892)

(Plate XXIX, fig. 3)

1892. *Diatomineura californica* Bigot, Mem. Soc. Zool. France, V, 618.

The following also refer to this species:

1887. *Pangonia dives* Williston, Trans. Kans. Acad. Sci., X, 130 (preoc.).

1904. *P. dives* Hine, Ohio Nat., V, 227; *D. californica* Big. a syn.

1921. *Diatomineura dives* Surcouf, Gen. Ins., CLXXV, 131.

Color. Brown-yellow; the anterior margins of the abdominal tergites more or less fuscous.

Size. Length, 13 mm. to 16 mm.

Structural and Color Characters. Female: Vertex, frontoclypeus and genae fulvous pollinose; genae and postgenae whitish-yellow pilose. Palpi slender, orange-yellow with black hairs. Antennae orange-yellow except the black apical half of the flagellum, the scape and pedicel with black hairs. Dorsum of thorax and scutellum fulvous pollinose, yellow pubescent; pleurae and venter grayish pruinose with yellow to white-yellow pile. Dorsum of abdomen brown-yellow; the broad anterior margins of tergites I and IV to VII fuscous; tergites II and III with a small fuscous median spot, rarely their whole anterior margins fuscous; apex, sides and discs of tergites with black pubescence, the hind margins of the segments yellow pubescent. Venter of abdomen variable; usually brown-yellow at the base and fuscous apically, sometimes almost entirely fuscous with yellow at the sides near the base and on the hind margins of the segments. Halteres brown. Wings subhyaline, the costal cell yellow; a stump at the bifurcation of vein R_{4+5} . Legs ferruginous; the front coxae, apex of front tibiae and entire tarsi, bases of all femora, apical segments of middle and hind tarsi, fuscous. Male: Like the female except for sex characters.

Comparative Notes. A distinct western species. Separated from congeneric species according to the key.

Remarks. Hine (1904) has indicated the synonymy of *Pangonia dives* Will. (1887) and *Diatomineura californica* Bigot (1892).

However, there is an earlier *Pangonia dives* of Macquart (1857), Dipt. Exot., Suppl. I, p. 25. Therefore Bigot's name must stand.

Type Data. Described from California. In the British Museum. I have studied the Williston types of *Pangonia dives*, two females and one male, California, in the Francis Huntington Snow Entomological Collection of the University of Kansas.

Distributional Data:

UNITED STATES: Washington 1, July 24; Oregon 1, July 17; California 3, June 30 - July 28; Idaho 2, July; Utah 1, July 3.

Stonemyia (Pilimas) jonesi (Cresson) (1919)

1919. *Silvius jonesi* Cresson, Proc. Acad. N. S. Phil., 175.

I have not seen this species. However, it may be of interest to include the original description along with the notes which Dr. J. Bequaert made from the types.

Original Description. In general appearance this interesting species does not suggest any affinity with *gigantulus* Loew, but more critical examination makes it reasonably certain that it belongs to a group including that species and is very distinct from any yet described, to my knowledge. It is much larger than that species and the abdomen has black or dark bases to all segments. The tibial and antennal characters certainly place this species in *Silvius*, although in general appearance it suggests some of those in *Pangonia*. The eyes are uniformly green when moistened. Male: black; antennae except four black terminal annuli of third joint, palpi, abdomen except dark bases of dorsal and ventral segments especially towards apex of abdomen, femora except bases, bases of tibiae tawny, or brown. Halteres pale. Wings blackish, more intense along costa. Subopaque. Yellow pruinose above, becoming gray below. All pile on head and thorax yellow and rather abundant, also on the narrow apices of abdominal segments; the broad bases of the segments with appressed black pile, similar on venter. Femora with pale pile, which on the tibiae becomes darker. Pile on first antennal joint and base of palpi, yellow; on second, and apices of palpi, black. No mesonotal vittae. No denuded areas on face. Proboscis not longer than head, and palpi is slightly more than half as long as proboscis. First antennal joint twice as long as second; third twice as long as first and second together; the thickened basal annulus nearly broad as long, the following annuli together as long as the basal one. Neuration as in *gigantulus*.

Length, 17 mm. Female: Similar, but frons twice as broad as width of antennae, entirely pruinose. Mesonotum more grayish.

Type. Male: Keddie, Plumas county, California, July 6, 1918 (F. M. Jones), (A. N. S. P. No. 61977). Paratype. One female; topotypical.

Bequaert's Notes. Type male and allotype female. A large Pangonia-like species, but the third antennal segment five-jointed only, the basal portion (or first segment) being superficially divided into four parts (then eight joints in all). The two basal antennal segments as in Pangoniinae. The antennae are more like those of Tabanus than any other Pangoniinae known to me. There are two very long spurs on the hind tibiae. In the male the eyes are distinctly hairy, in the female they are bare. The face is short convex (not snout-like) and without shiny callosities. Ocelli present. Frons without callosity. Proboscis about as long as height of head. Palpi slender and narrowly pointed, longer than half the proboscis in female, in the male very little shorter than the proboscis. Anal cell closed; all posterior cells open. A distinct appendix to the upper branch of the fourth vein. Tarsi of male normal. In Enderlein's key it runs to *Silviini*, but it is certainly not a *Silvius*. I regard it as an aberrant species of *Scaptia*, in which the divisions of the base of the third segment of the antenna are more fused than usual in the genus and the eyes are hairy in the male only.

Goniops Aldrich (1892)

1892. *Goniops* Aldrich, *Psyche*, VI, 236.

Generic Characters. Eyes bare, holoptic in the male, dichoptic in the female, in the latter very small and narrow, acutely angulate above, the width of one being less than that of the broad vertex. Ocelli present. Vertex broad, gradually convergent above. Antennal prominence conspicuous, slightly exceeding the frontoclypeus. Flagellum of antenna eight-segmented, the basal segment more or less disc-shaped. Palpi at least three fourths the length of the proboscis, which is distinctly shorter than the head. Cell R_5 of the wings broadly open.

Genotype. *Pangonia chrysocoma* Osten Sacken (1875).

Remarks. Up to the present this genus is represented by one species only. It is doubtful whether or not the infuscation of the anterior portion of the wings is of any generic value.

Goniops chrysocoma (Osten Sacken) (1875)

(Plate XXIX, fig. 10; Plate XXXV, fig. 77)

1875. *Pangonia chrysocoma* Osten Sacken, Prodrôme I, 368.
 1887. *P. chrysocoma* Williston, Trans. Kans. Acad. Sci., X, 130.
 1900. *Goniops chrysocoma* Hine, Ent. News, XI, 392 (syn.).
 1901. *G. chrysocoma* Hine, Ohio Nat., II, 168.
 1903. *G. chrysocoma* Hine, Ohio St. Acad. Sci. Spec. Pap. No. 5, 46.
 1903. *G. chrysocoma* Malloch, Bull. Ill. State Lab. N. H., XII, 356.
 1908. *G. chrysocoma* Walton, Ent. News, XIX, 464 (biol.).
 1911. *G. chrysocoma* McAtee, Proc. Ent. Soc. Wash., XIII, 21-29 (biol.).
 1918. *G. chrysocoma* McAtee and Walton, Proc. Ent. Soc. Wash., XX, 191.
 1920. *G. chrysocoma* Marehand, Mon. Rock. Inst., No. 13, p. 56.
 1921. *G. chrysocoma* Sureouf, Gen. Ins., CLXXV, 104.
 1930. *G. chrysocoma* Schwardt and Hall, Bull. 256, Ark. Exp. Sta., p. 26.
 1930. *G. chrysocoma* Stone, Ann. Ent. Soc. Am., XXIII, 293 (biol.).
 1934. *G. chrysocoma* Schwardt, Jl. Kans. Ent. Soc., VII, 73 (biol.).

The following also refers to this species:

1892. *Goniops hippoboscoides* Aldrich, Psyche, VI, 236.

Color. Female, straw-yellow; male, dark brown; large anterior portion of wings infuscated.

Size. Length, 9.5 mm. to 14 mm.

Structural and Color Characters. Female: Vertex, genae, and occiput yellow pollinose, the first more or less denuded on the disc. Frontoclypeus yellow; bare. Palpi and antennae yellow, the former with conspicuous black pubescence. Proboscis brown-yellow. Entire body straw-yellow with pale-yellow pubescence and pile in the usual regions, that of the abdominal dorsum most dense at the posterior margins of the segments. Halteres yellow. Wings infuscated as follows: Cells R, 2d M and 1st A except at their extreme bases and a small round hyaline spot in cell 2d M at the bifurcation of vein M, also the apical portion of cell 1st A is more or less hyaline along vein 2d A; cell R₁ apically from the yellow stigma; cells R₃ and R₄ entirely, except for a subhyaline area along the apical portion of the latter; the proximal half of cell R₅ (in this cell the color is solid up to the bifurcation of veins M₁ and M₂, from which it extends across to the bifurcation of vein R₄₊₅, thence tapering along vein R₅); the proximal third of cell 1st M₂; the extreme base of cell M₃; the basal portion of cell Cu₁ and tapering along vein Cu₂. Legs pale yellow; apical tarsal segments darker. Male: Antennae yellow with long black hairs on the two basal segments; palpi and proboscis brown, the former with long black hairs; genae and frontoclypeus fulvous brown pollinose with fulvous pile. Dorsum of thorax and scutellum fuscous with sparse pale-yellow pubescence and long dark pile, the former with two faint pale stripes most

apparent anteriorly; pleurae and venter gray-brown pruinose with pale yellow and some black pile. Dorsum of abdomen fuscous with black pubescence, the hind margins of the segments yellow with yellow pubescence. Venter light brown with yellow pubescence, the apical segments somewhat darker on their discs. Halteres yellow. Wings like the female except that the infuscation is darker and the costal cell is yellow except at the base. Legs yellow; the apical two segments of the front and hind tarsi, fuscous.

Remarks. This most interesting species (the only one of its genus) is so well known and so distinct that it need be discussed no further within the scope of this paper. Schwardt (1934) has contributed valuable information on the biology and habits of *G. chrysocoma*.

Type Data. I have seen the type female in the Museum of Comparative Zoölogy, Cambridge, Massachusetts. It is somewhat faded, but otherwise in excellent condition. Osten Sacken gives as the habitat the Middle States; Trenton Falls, New York and Delaware. According to the author a type male is in the Museum of the Entomological Society of Philadelphia.

Distributional Data:

UNITED STATES: New York 1, Aug. 9; Maryland 2, May 29, July 14; Pennsylvania 5, June 3-27; Virginia 3, June 19-July; West Virginia 1, Aug. 11; Ohio 5, June 13-July 24; Arkansas 1, May 19-22 (reared).

In addition, reported by others from:

UNITED STATES: New Jersey, Delaware, District of Columbia.

Apatolestes Williston (1885)

1885. *Apatolestes* Williston, Entom. Amer., I, 12.

Generic Characters. Eyes hairy or bare, contiguous in the male, broadly separated in the female. Ocelli present. Vertex broad. Flagellum of antennae eight-segmented. Palpi stout, dorsally grooved. Proboscis shorter than the head, scarcely longer than the palpi. Wings with a stump at the bifurcation of vein R_{4+5} .

Genotype. *Apatolestes comastes* Williston (1885).

Remarks. With the possible exception of *A. comastes*, all species of this genus appear to be confined to California.

KEY TO SPECIES

1. Eyes hairy (Comops).....hera (O. S.), p. 375
- Eyes bare (Apatolestes)..... 2
2. Pile of head thorax and front coxae black, with some fulvous intermixed;
- palpi dark 3
- Pile of head, thorax and front coxae white; palpi light..... 4

3. Shining black species; vertex shining black inflated above antennae like a frontal callus; abdominal tergite without light hind margins.....*ater* n. sp., p. 371
- Dull black species; vertex not shining fulvous pollinose about the edges, no callus-like area; abdominal tergites with gray hind margins.....*hinei* n. sp., p. 374
4. Vertex shining black, inflated above antennae like a frontal callus; length not exceeding 11 mm..... 5
- Vertex not shining black, no callus-like area; length about 14 mm..... 6
5. Antennae yellowish, apex of flagellum black, palpi with pale pubescence; costal cell of wing hyaline.....*comastes* Will., p. 372
- Antennae black, palpi with black pubescence; costal cell of wing yellow.
comastes willistoni n. var., p. 373
6. Palpi tenuous at apex, brown species.....*albipilosus* n. sp., p. 371
- Palpi not tenuous at apex, gray brown species.....*similis* n. sp., p. 374

Subgenus *Apatolestes* s. str.

Under this group I am placing all species with eyes bare.

Apatolestes (*Apatolestes*) *albipilosus*, new species

Color. Light brown with some gray pruinosity; wings lightly fumose, most saturate at the costal margin and along the veins.

Size. Length, 14 mm.

Structural and Color Characters. Female: Vertex light brown with some yellow pollen; genae and frontoclypeus grayish-yellow pollinose with little black and much whitish pile. Antennae yellow except the black at the apex of the flagellum. Palpi yellow with black pubescence. Thorax and scutellum light brown with a gray pruinosity, the former with obscure stripes on the dorsum. Abdomen light brown, gray pruinose, with light-gray posterior margins on all segments. Wings pale fumose, most saturate at the costal area and along the veins; an appendage at the bifurcation of vein R_{4+5} . Legs light brown with intermixed black and whitish pubescence; the front coxae with white pile.

Comparative Notes. Separated from *A. hinei* n. sp. as indicated under that description.

Type Data. Holotype, female; Lemon Cove, California; July 26, 1929; R. H. Beamer. In the Francis Huntington Snow Entomological Collection of the University of Kansas. One female San Joaquin river near Fresno, California, August 15, 1922. (U. S. N. M.)

Apatolestes (*Apatolestes*) *ater*, new species

Color. Shining black.

Size. Length, 13 mm.

Structural and Color Characters. Female: Vertex shining black with traces of gray pollen, the anterior vertex inflated, thus forming

a broad quadrate area similar to a frontal callus. Ocelli white. Fronto-clypeus and genae grayish pollinose with brown-gray pile. Antennae black, scape and pedicel gray pollinose with black pubescence. Palpi appear black, although the ground color is somewhat reddish, with dense black pubescence. Thorax and scutellum black, the former with faint streaks of gray on the dorsum; pleurae with blackish pile. Abdomen black, the posterior margins of the segments scarcely differentiated as to color. Wings fumose, costal cell and stigma brown; an appendage at the bifurcation of vein R_{4+5} . Legs black. Male: Similar to the female except for sex characters. Frontal triangle fulvous pruinose. The large facets occupy the upper three fourths of the eyes.

Comparative Notes. The shining black appearance of *A. ater* should be sufficient to separate it from the other species of *Apatolestes*. The vertex resembles that of *A. comastes* Will., but the dark pile of the facial regions is distinctive, as well as its larger size. The male is readily separated from that of *A. hinei* n. sp. by the abdominal tergites, which lack pale hind margins.

Type Data. Holotype, female; San Diego, California; July 7, 1929; Paul W. Oman. Allotype, male; Claremont, California. Paratype, one female; same data. Holotype and paratype in the Francis Huntington Snow Entomological Collection of the University of Kansas. Allotype in the Ohio State Museum, Columbus, Ohio.

Apatolestes (Apatolestes) comastes Williston (1885)

(Plate XXIX, fig. 11; Plate XXXV, fig. 76)

1885. *A. comastes* Williston, Entom. Amer., I, 12.
?1895. *A. comastes* Townsend, Proc. Cal. Acad. Sci., IV, 596.
1904. *A. comastes* Hine, Ohio Nat., V, 230.
1923. *A. comastes* Cole, Proc. Cal. Acad. Sci., XII, 458.

Color. Gray-black.

Size. Length, 8 mm. to 11 mm.

Structural and Color Characters. Female: Vertex shining black, slightly inflated anteriorly, much like a frontal callus; fronto-clypeus and genae whitish pollinose with white and very little black pile intermixed; palpi yellowish with gray pruinosity and whitish pubescence; antennae yellowish-brown except the black apex of the flagellum. Dorsum of thorax and scutellum black, gray pruinose, the former with narrow faint gray stripes; pleurae and venter gray-black, pruinose, with white pile. Abdomen gray-black, pruinose, the segments with whitish hind margins. Halteres brown. Wings sub-

hyaline; veins brown; a stump at the bifurcation of vein R_{4+5} . Legs light brown and black, the latter distributed as follows: Front and hind coxae and femora, front tarsi and sometimes the apex of the front tibiae, and a little on the middle femora. The front coxae are covered with grayish pollen and white pile. Male: Unknown.

Comparative Notes. The gray-black or bluish-gray color is characteristic for this species. This along with the white hind margins of the abdominal tergites and the shining black inflated anterior vertex permits ready separation. See, also, under descriptions of *A. ater* and *A. hinei*, new species.

Remarks. In the series of *A. comastes* which I have for study I find two distinct forms, one of which differs sufficiently from the type so that it deserves varietal rank. See under description of *A. comastes willistoni* n. var.

Type Data. Described from two females from California. In the Francis Huntington Snow Entomological Collection of the University of Kansas.

Distributional Data:

UNITED STATES: California: Lemon Cove, July 26, 1929; Three Rivers, Aug. 1, 1929; Marin Co., Aug. 3, 1929; California, "Baron"; Los Angeles Co., July; Cloverdale, Oct. 6, 1915.

In addition, reported by others from:

UNITED STATES: Arizona.

Apatolestes (Apatolestes) comastes willistoni n. var.

Color. Gray-black.

Size. Length, 8 mm. to 11 mm.

Structural and Color Characters. Female: Similar to *A. comastes* Will. with the following differences: The costal cell of the wing is yellow; the antennae are wholly black, sometimes the scape and pedicel with some grayish pruinosity; palpi with black pubescence and a little white intermixed. The legs are predominantly black; basal half of front tibiae, basal three fourths of middle and hind tibiae, basal segments of middle and hind tarsi, light brown.

Type Data. Holotype, female: San Diego county, California; July 7, 1929; Paul W. Oman. Paratypes, eight females, San Jacinto Mts., California, July 21, 1929; R. H. Beamer, Paul W. Oman, and L. D. Anderson; eight females, San Diego county, California; R. H. Beamer, Paul W. Oman, and L. D. Anderson; two females, Big Bear Lake, California, July 26, 1932, J. D. Beamer; one female, Laguna Mts., California, July 6, 1929; R. H. Beamer.

Apatolestes (Apatolestes) hinei, new species

Color. Gray-brown; abdominal segments with pale posterior margins.

Size. Length, 12 mm. to 14 mm.

Structural and Color Characters. Female: Posterior vertex brown with a trace of gray-yellow pollen; anterior vertex, frons, frontoclypeus and genae pollinose, these last two with fulvous and black pile. Scape and pedicel reddish or yellowish with black hairs; flagellum black apically, at its base reddish. Palpi, concolorous with basal antennal segments, with long black pubescence. Dorsum of thorax, scutellum, pleurae and venter brown-gray pollinose; the first with obscure stripes of alternate gray and brown. Abdomen gray-brown with blackish pile; the posterior margins of all segments conspicuously pale yellow-gray with whitish pile. Wings fumose, subcostal cell, stigma and veins light brown; an appendage at the bifurcation of vein R_{4+5} . Legs brown with black hairs; anterior coxae, femora, and apical portions of tarsi nearly fuscous. Male: Like the female except for sex characters. More densely pilose about the head, thorax, and pleurae. The large facets, distinctly differentiated from the small ones, occupy about the upper three fourths of the eyes.

Comparative Notes. The general aspect of this species is that of a large *A. comastes* Will. However, the different color, large size, more fumose wings, absence of a shining black area on the anterior vertex, yellowish facial regions with fulvous pile, readily separate these two. *A. hinei* is more nearly related to *A. albipilosus*, but the latter exhibits a lighter brown color throughout. The pilosity of the head and thorax is mostly white and the front femora and coxae are concolorous with the remainder of the legs.

Type Data. Holotype female; San Jacinto Mts., July 21, 1929; R. H. Beamer. Allotype, male; same locality and date; Paul W. Oman. Paratypes, two males, same data as holotype and allotype, respectively; three females, same data; one female, Alpine, California, July 9, 1929; Paul W. Oman. In the Francis Huntington Snow Entomological Collection, of the University of Kansas.

Apatolestes (Apatolestes) similis, new species

Color. Gray.

Size. Length, 14 mm.

Structural and color characters. Female: Vertex (except a broad, denuded brown mid-streak), genae and frontoclypeus, gray-

white pollinose; the genae and postgenae with white and a little black pile. Palpi gray-yellow, with black and white hairs. Flagellum of antenna black; scape and pedicel gray-yellow with black and white hairs. Dorsum of thorax and scutellum black, gray pruinose, white pubescent, the former with faint stripes; pleurae and venter gray pruinose with white pile and on the humeri some black. Abdomen gray pollinose with black and white pubescence, the former dominant along the sides and apex, and discs of tergites, the latter conspicuous on the whitish hind margins of the segments; a ferruginous ground color shows through the pruinosity on the venter, near the base. Halteres yellow-brown. Wings subhyaline. Legs red-brown, darker basally and apically. Male: Like the female and easily associated.

Comparative Notes. Except for color this species has the habitus of *A. albipilosus* n. sp., but in that species the costal cells of the wings are yellowish and the palpi are more tenuous apically.

Type Data. Holotype, female, Los Angeles Co., California, July. Allotype, male, same data. In the United States National Museum.

Subgenus *Comops*, new subgenus

I am erecting this subgenus to receive the species *A. hera* (O.S.), at present the only one known with hairy eyes.

Apatolestes (*Comops*) *hera* (Osten Sacken) (1877)

1877. *Pangonia hera* Osten Sacken, West. Dipt., 214.

1904. *P. hera* Hine, Ohio Nat., V, 227.

1921. *Diatomineura hera* Surcouf, Gen. Ins., CLXXV, 130.

1925. *Apatolestes hera* Parker, Proc. Ent. Soc. Wash., XXVII, 195.

Color. Gray-brown, wings fumose.

Size. Length, 11 mm. to 14 mm.

Structural and Color Characters. Female: Vertex brown, anteriorly and laterally grayish pollinose, otherwise denuded; frontoclypeus and genae gray pollinose with whitish pile; palpi gray pruinose with white pubescence; scape and pedicel of antennae reddish or brown-yellow, flagellum black except for a minute reddish portion at the base. Thorax gray-brown, whitish pilose. Abdomen concolorous with thorax, whitish pilose, the segments with narrow pale hind margins. Wings fumose; a stump at bifurcation of vein R_{4+5} . Legs red-brown, darker basally and apically; the coxae and femora with white pile. Male: Similar to female except for sex characters. The dense pile about the head and thorax appears to have a tinge of yellow.

Comparative Notes. Easily distinguished from all other Apatolestes by the hairy eyes.

Remarks. According to recent writers, this species because of its hairy eyes would not be an Apatolestes. In both Enderlein's (1925) and Kröber's (1932) keys *A. hera* runs unsatisfactorily to either *Osca* Walker or *Protodasyapha* Enderlein. Both of these genera appear to be confined to western South America. Bequaert (1930) makes *Osca* a synonym of *Scaptia* Walker (the latter having page priority), but it is impossible to run *A. hera* in his key to Ethiopian Tabanidae to *Scaptia*, neither does it conform to notes or figures of Australian *Scaptia*. See Ferguson (1926). Also, this species does not compare favorably with the genotypes of *Scaptia* or *Osca* (*S. aurata* Macq. and *O. lata* Guer.) or with Enderlein's description of *Protodasyapha*. The sole character by which *A. hera* differs from the genotype of *Apatolestes* (*A. comastes* Will.) and all other species of the genus is the pilosity of the eyes. In the case of this group I doubt the generic value of such a character, but feel that it is of sufficient importance to give it subgeneric rank.

Type Data. Described from one female. In the Museum of Comparative Zoölogy, Cambridge, Massachusetts. I have studied this specimen. Osten Sacken (1877) states, "Habitat—San Francisco, California, caught in the street twice, by Mr. Henry Edwards in July. I have a single female."

Distributional Data:

UNITED STATES: California: Los Angeles Co., July; Pasadena, June 8, 1895. San Francisco, July 19-22, 1925.

Bequaertomyia, new genus

Generic Characters. Hind tibiae with apical spurs; vein 2d A sinuous, all marginal cells open; eyes densely pubescent in both sexes; ocelli present; vertex of the female broad; flagellum of the antenna eight-segmented; frontoclypeus very prominent; proboscis much shorter than the head; palpi short, arcuate, pointed. The abdominal segments of the female caudad from V are narrowed and laterally compressed, when completely exerted appear to be modified for oviposition.

Comparative Notes. The sinuous anal vein would place this genus in the subfamily Coenomyiinae of Bequaert (1930), but until further study gives more evidence to the contrary, I prefer to include all North American genera of Tabanidae with apical spurs on the hind tibiae in the subfamily Pangoniinae. *Bequaertomyia* has

no close relatives in North America; however, its general aspect would indicate affinities with the Chilean genus *Coenura* Bigot, from which it differs in the pubescence of the eyes and the palpi which are pointed at the ends and not scooped out. *Coenomyia* Latreille (not included in this paper for want of material and evidence) is the only other genus north of Mexico which Bequaert has assigned to his *Coenomyiinae*, but it is not sufficiently close to *Bequaertomyia* to necessitate calling attention to its distinctness.

Named in honor of Dr. J. Bequaert, who has contributed evidence to show that this genus and the genera *Coenomyia* Latreille, *Coenura* Bigot, and *Pelecorhynchus* MacQuart form a transitional group between the Leptidae and Tabanidae.

I hereby designate the following species *Bequaertomyia anthracina*, new species, as the genotype.

Bequaertomyia anthracina, new species

(Plate XXIX, figs. 5, 7, 9, 12; Plate XXXV, fig. 83)

Color. Coal black, wings fumose, antennae and palpi orange.

Size. Length, 13 mm. to 15 mm.; length of wing, 12 mm. to 13 mm.; width of vertex barely 1 mm.

Structural and Color Characters. Female: Dense black pilose. Head scarcely as broad as the thorax. Eyes pubescent, broadly separated by the vertex. Antennae orange; the scape and pedicel of equal length, together about as long as the first segment of the flagellum. Vertex with a slightly convex shining black quadrate callus-like area, broader than long. Posterior vertex somewhat hollow; ocelli yellowish, mounted on a high gray-pollinose tubercle. Frontoclypeus shining black, prominent, globose, somewhat covered by gray pollen near the oral margin. Frons and genae gray pollinose. Proboscis very short, about one half the length of the head; labellae large and fleshy. Palpi short, arcuate, pointed; orange with long black pile. The black of the dorsum of the thorax with dark-gray pollen; the distinctly projecting humeral callus orange. Scutellum, pleural and sternal regions shining black. Halteres orange. Abdomen broad at base, shining black. Wings fumose with a yellowish tinge at the base, most saturate along the costal area and in cells R and R_1 ; veins light brown to orange. Legs black, the usual basal portions of the tibiae and tarsi lighter, nearly a dull red-brown, especially noticeable in the posterior tibiae. Male: Like the female except for the usual sex characters. The eyes are contiguous, the pubescence and pile longer and more dense, pro-

ducing a shaggy appearance. Abdomen gradually tapering from its base.

Type Data. Holotype: Female, Giant Forest, California; July 28, 1929; R. H. Beamer. Allotype: Male, Signal Park, Washington; July 4, 1930. Paratypes: Three females, Giant Forest, California; July 28, 1929; R. H. Beamer, L. D. Anderson, and Paul W. Oman, respectively. In the Francis Huntington Snow Entomological Collection of the University of Kansas.

Species reported from North America north of Mexico not included within this paper because of insufficient or no evidence for identification:

Chrysops cincticornis Walker (1848) List, I, 201; N. A.?

Chrysops sepulchralis (Fabricius) (1794) Ent. Syst. IV; Europe.

Pangonia macroglossa Westwood (1835) Lond. and Edinb. Philos. Mag., ser. 3, VI; Ga.

Corizoneura velutina Bigot (1892) Mem. Soc. Zoöl. France, V, 615; Calif.

Ricardoia latiflagrum Enderlein (1925) Mitt. Mus. Berlin, XI, 291; Texas. [May be *E. incisuralis* (Say).]

ADDENDA

Chrysops lapponica Loew (1858) Zoöl.-bot. Ges. Wien., VIII, 624.

This North European species is apparently represented in our fauna. There is one female, Shippigan, N. B., July 14, 1931, J. M. Aldrich, in the United States National Museum which compares quite favorably with European specimens. The black of the antennae, palpi, legs and body is more extensive. The wing picture is similar except for a broader apical spot. The abdominal pattern somewhat resembles *C. nigripes* Zetterstedt.

I am aware that this is scant evidence to show that *C. lapponica* is nearctic as well as palaearctic, but at the time of writing no other course presents itself.

LITERATURE CITED

- BEQUAERT, J. 1924. "Notes Upon Surcouf's Treatment of the Tabanidae in the Genera Insectorum and Upon Enderlein's Proposed New Classification of this Family." *Psyche*, vol. XXXI, pp. 24-40.
- . 1930. "Medical and Economic Entomology." Report of the Harvard African Expedition Upon the African Republic of Liberia and the Belgian Congo, pp. 858-971.
- BRIMLEY, C. S. 1922. "Additional Data on North Carolina Tabanidae, Bombyliidae and Tachinidae (Diptera)." *Entomological News*, XXXIII, pp. 230-232.
- BRIMLEY, S. W. 1926. "The External Anatomy of the Black Horsefly *Tabanus atratus* Fab. (Diptera: Tabanidae)." *Annals of the Entomological Society of America*, vol. XIX, pp. 440-460.
- CAMERON, A. E. 1926. "Bionomics of the Tabanidae (Diptera) of the Canadian Prairie." *Bulletin of Entomological Research*, vol. XVII, pp. 1-42.
- COLE, F. R. 1927. "A Study of the Terminal Abdominal Structures of Male Diptera." *Proceedings of the California Academy of Science*, vol. XVI, p. 240.
- DAECKE, E. 1906. "On the Eye Coloration of the Genus *Chrysops*." *Entomological News*, vol. XVII, pp. 39-42.
- . 1907. "Annotated List of the Species of *Chrysops* Occurring in New Jersey and Descriptions of Two New Species." *Entomological News*, vol. XVIII, pp. 139-146.
- ENDERLEIN, G. 1925. "Studien an blutsaugenden Insekten. I. Grundlagen eines neuen Systems der Tabaniden. Mit 5 Textfiguren." *Mitteilungen aus dem Zoologischen Museum in Berlin*, Bd. 11, hft 2, s. 253-409.
- FERGUSON, E. W. 1926. "Additional Notes on the Nomenclature of Australian Tabanidae." *Bulletin of Entomological Research*, XVI, part 4, pp. 293-306.
- FRANCIS, E., AND MAYNE, B. 1922. "Experimental Transmission of Tularemia by Flies of the Species *Chrysops discalis*." *United States Public Health Service, Hygienic Laboratory, Bulletin 130*, pp. 8-16.
- GREENE, C. T., 1909. "Male of *Chrysops brimleyi* Hine." *Entomological News*, XX, p. 302.
- HINE, J. S. 1903. "Tabanidae of Ohio." *Ohio State Academy of Science, Special Papers*, No. 5, 57 pages.
- . 1903. "On the Life History of *Tabanus vivax*." *The Ohio Naturalist*, vol. IV, pp. 1, 2.
- . 1904. "The Tabanidae of Western United States and Canada." *The Ohio Naturalist*, vol. V, pp. 217-248.
- . 1906. "Habits and Life Histories of Some Flies of the Family Tabanidae." *United States Department of Agriculture, Bureau of Entomology, Technical Series No. 12, Part II*, pp. 19-38.
- . 1906. "A Preliminary Report on the Horseflies of Louisiana With a Discussion of Remedies and Natural Enemies." *State Crop Pest Commission of Louisiana, Circ. No. 6*, 43 pages.

- . 1907. "Second Report Upon the Horseflies of Louisiana." Louisiana Agricultural Experiment Station Bulletin No. 93, 59 pages.
- KRÖBER, Q. 1926. "Die Chrysops Arten Nordamerikas einschl. Mexicos." Stettiner Entomologische Zeitung, vol. LXXXVII, pp. 209-353.
- . 1932. "Bemerkungen über die Systematik der Neotropischen Tabaniden, nebst Bestimmungstabelle der Subfamilien und Gattungen (Mit 6 Figuren)." Revista de Entomologia, II, fasc. 2, pp. 185-202.
- MALLOCH, J. R. 1917. "A Preliminary Classification of Diptera, Exclusive of Pupipara, Based Upon Larval and Pupal Characters, with Keys to Imagines in Certain Families." Bulletin of the Illinois State Laboratory of Natural History, vol. XII, pp. 161-407.
- MARCHAND. 1919. "Collecting the Larvae of Tabanus and Chrysops (Diptera)." Entomological News, vol. XXX, pp. 131-137.
- . 1920. "The Early Stages of Tabanidae (Horseflies)." Rockefeller Institute for Medical Research, Monograph No. 13, 203 pages, 15 plates.
- MITZMAIN, M. B. 1913. "The Biology of *Tabanus striatus* Fabricius, the Horsefly of the Philippines." Philippine Journal of Science, vol. VIII, pp. 197-221.
- . 1913. "The Mechanical Transmission of Surra by *Tabanus striatus* Fabricius." Philippine Journal of Science, vol. VIII, pp. 223-229.
- MCATEE, W. L., AND WALTON, W. R. 1918. "District of Columbia Diptera: Tabanidae." Proceedings of the Entomological Society of Washington, vol. XX, pp. 188-206.
- OSTEN SACKEN, C. R. 1875. "Prodrome of a Monograph of the Tabanidae of the United States." Part I: Part II, 1876; Supplement, 1878. Memoirs of the Boston Society of Natural History, vol. II, Part IV, Nos. 1, 4, and 6.
- . 1877. "Western Diptera: Descriptions of New Genera and Species of Diptera from the Region West of the Mississippi and Especially from California." Bulletin of the United States Geological Survey, III, pp. 189-354.
- PHILIP, C. B. 1931. "The Tabanidae (Horseflies) of Minnesota, with Special Reference to Their Biologies and Taxonomy." Minnesota Agricultural Experiment Station, Technical Bulletin 80, 132 pages.
- RICARDO, G. 1901. "Further Notes on the Pangoninae of the Family Tabanidae in the British Museum Collection." Annals and Magazine of Natural History, ser. 7, VIII, pp. 286-315.
- SCHWARDT, H. H. 1931. "The Biology of *Tabanus lineola* Fabricius." Annals of the Entomological Society of America, vol. XXIV, pp. 409-416.
- . 1932. "The Life Histories of Two Horseflies." Annals of the Entomological Society of America, vol. XXV, pp. 631-637.
- . 1934. "Biological Notes on *Goniops chrysocoma* (O. S.) (Diptera: Tabanidae)." Journal of the Kansas Entomological Society, VII, No. 3, pp. 73-79.
- SCHWARDT, H. H., AND HALL, D. G. 1930. "Preliminary Studies on Arkansas Horseflies." Arkansas Agricultural Experiment Station Bulletin No. 256, 27 pages.
- SHANNON, R. C. 1916. "Two New North American Diptera." Insector Inscitiae Menstruus, IV, pp. 69-72.

- STONE, A. 1930. "The Bionomics of Some Tabanidae (Diptera)." *Annals of the Entomological Society of America*, vol. XXIII, pp. 261-304.
- WALKER, F. 1848. *List of the Specimens of Dipterous Insects in the Collection of the British Museum*, Part I, 229 pages.
- WEBB, J. L., AND WELLS, R. W. 1924. "Horseflies: Biologies and Relation to Western Agriculture." *United States Department of Agriculture, Departmental Bulletin*, No. 1218.
- WEHR, E. E. 1924. "A Synopsis of the Tabanidae of Nebraska, With a Description of a New Species from Colorado." *Nebraska University Studies*, vol. XXII, pp. 107-118.
- WIEDEMANN, C. R. W. 1828. *Aussereuropäische Zweiflügelige Insekten*, I, pp. I-XXXII, 1-608, 6 plates.

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PLATE XXIX

FIG. 1. *Esenbeckia incisuralis* (Say) female, anterior view of head.

FIG. 2. *Chrysops bcameri* n. sp. female, anterior view of head. Typical for a large group in which the vertex is longer than broad.

FIG. 3. *Stonemyia* (*Pilimas*) *californica* (Bigot) female, anterior view of head. Drawn from type of *Pangonia dives* Williston.

FIG. 4. *Chrysops latifrons* n. sp. female, anterior view of head. Typical for small western group in which the vertex is as broad as, or broader than long.

FIG. 5. *Bequaertomyia anthracina* n. g., n. sp., section of wing showing vein 2d A sinuous.

FIG. 6. *Chrysops brunnea* Hine male, anterior view of head showing eyes contiguous.

FIG. 7. *Bequaertomyia anthracina* n. g., n. sp. female, dorsal aspect of abdomen with caudal segments exerted.

FIG. 8. *Chrysops clavicornis* n. sp. male, anterior view of head showing eyes closely approximated, but distinctly separate. Typical of small western group.

FIG. 9. *Bequaertomyia anthracina* n. g., n. sp. female, lateral aspect of head.

FIG. 10. *Goniops chrysocoma* (Osten Sacken) female, anterior view of head.

FIG. 11. *Apatolestes comastes* Williston female, anterior view of head. Drawn from type.

FIG. 12. *Bequaertomyia anthracina* n. g., n. sp. female, anterior view of head.

PLATE XXIX

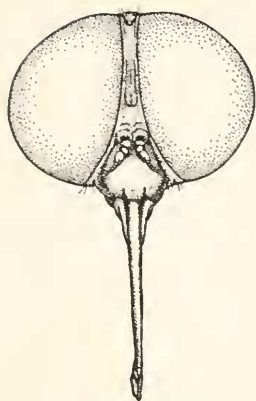
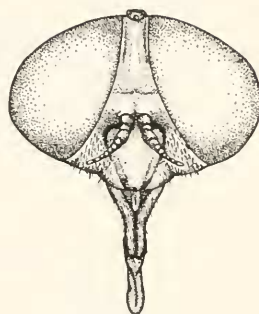
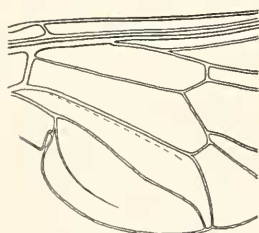
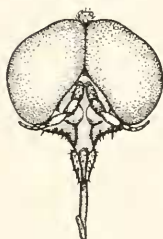
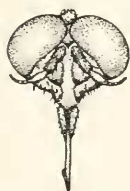
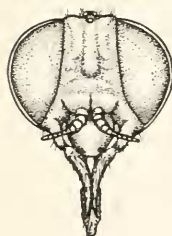
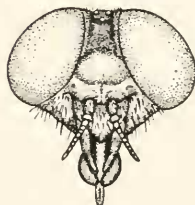
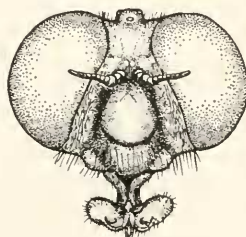
1 *E. INCISURALIS*2 *C. BEAMERI*3 *S. CALIFORNICA*4 *C. LATIFRONS*5 *B. ANTHRACINA*6 *C. BRUNNEA*7 *B. ANTHRACINA*8 *C. CLAVICORNIS*9 *B. ANTHRACINA*10 *G. CHRYSOCOMA*11 *A. COMASTES*12 *B. ANTHRACINA*

PLATE XXX

FIGS. 13 to 24. Wing pictures of typical female Chrysops.

PLATE XXX

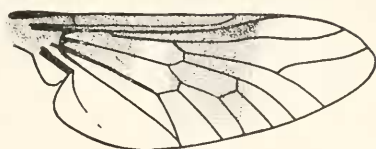
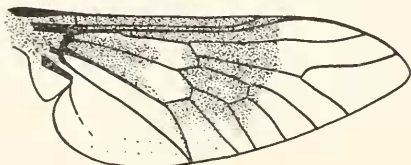
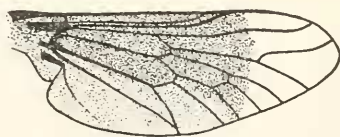
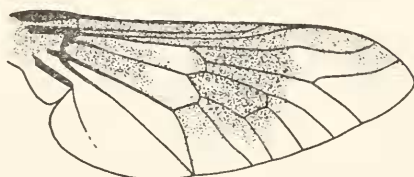
13 *FULVISTIGMA*14 *CUCLUX*15 *SORDIDA*16 *NIGRA*17 *NIGRIBIMBO*18 *MITIS*19 *CELER*20 *CARBONARIA*21 *EXCITANS*22 *DIVISA*23 *NOCTIFERA*24 *PERTINAX*

PLATE XXXI

FIGS. 25 TO 37. Wing pictures of typical female Chrysops.

PLATE XXXI

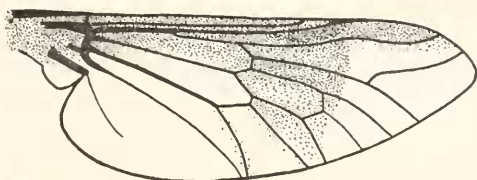
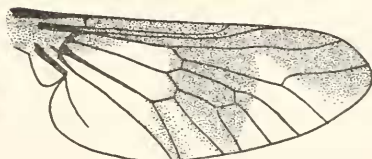
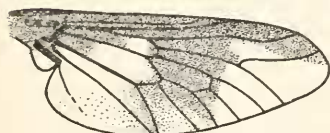
25 *BRIMLEYI*26 *BISHOPPI*27 *SURDA*28 *MONTANA*29 *PROCLIVIS*30 *DIMMOCKI*31 *DELICATULA*32 *SACKENI*33 *CALLIDA*34 *COLORADENSIS*35 *AESTUANS*37 *FURCATA*36 *NIGRIPES*

PLATE XXXII

FIGS. 38 to 49. Wing pictures of typical female Chrysops.

PLATE XXXII

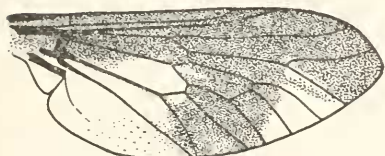
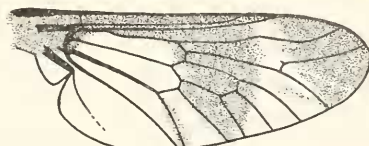
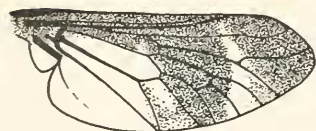
38 *SHERMANI*39 *STRIATA*40 *BEAMERI*41 *PUDICA*42 *VITTATA*43 *VITTATA FLORIDANA*44 *CURSIM*45 *GEMINATA*46 *LATERALIS*47 *PIKEI*48 *SEQUAX*49 *INDA*

PLATE XXXIII

FIGS. 50 to 63. Wing pictures of typical female Chrysops. Figures 50, 52 and 58 from the types.

PLATE XXXIII

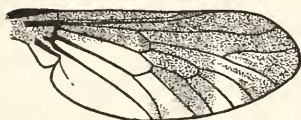
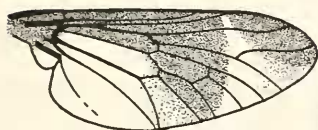
50 *OBSOLETA*51 *PARVULA*52 *WIEDEMANNI*53 *ULTIMA*54 *LUGENS*55 *HINEI*56 *UNIVITTATA*57 *DORSOVITTATA*58 *SEPARATA*59 *MOECHA*60 *FULIGINOSA*61 *AMAZON*62 *FRIGIDA*63 *BISTELLATA*

PLATE XXXIV

FIGS. 64 to 75. Wing pictures of typical female Chrysops.

PLATE XXXIV

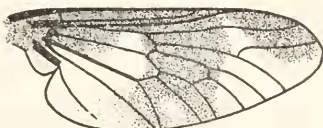
64 *CLAVICORNIS*65 *COQUILLETII*66 *FACIALIS*67 *ROBUSTA*68 *PACHYCERA*69 *FLAVIDA*70 *FULVASTRA*71 *VIRGULATA*72 *DISCALIS*73 *DISSIMILIS*74 *LATIFRONS*75 *BRUNNEA*

PLATE XXXV

FIGS. 76 to 93. Lateral aspects of antennae characteristic of nearctic Pan-goniinae.

PLATE XXXV

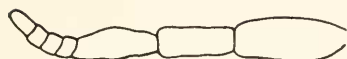
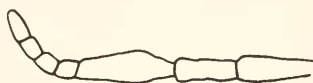
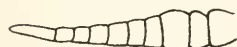
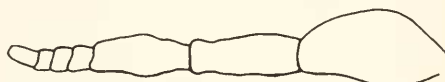
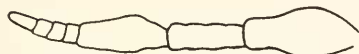
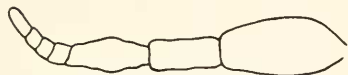
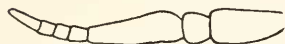
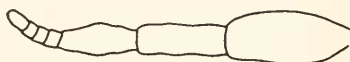
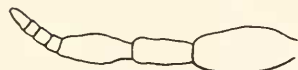
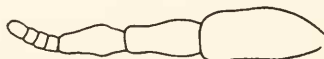
76 *A. COMASTES*77 *G. CHRYSOCOMA*78 *E. INCISURALIS*79 *C. DISSIMILIS*80 *C. FLAVIDA*81 *C. BRUNNEA*82 *C. VITTATA*83 *B. ANTHRACINA*84 *C. COQUILLETII*85 *C. CLAVICORNIS*86 *C. BEAMERI*87 *C. ROBUSTA*88 *C. VIRGULATA*89 *S. GIGANTULUS*91 *C. PACHYCERA*90 *C. FULVAstra*93 *C. LATIFRONS*92 *C. FACIALIS*

PLATE XXXVI

FIG. 94. *Stonemyia* (*Stonemyia*) *tranquilla* (Osten Sacken) female, anterior aspect of head. V = vertex.

FIG. 95. *Silvius laticallus* n.sp. female, anterior aspect of head.

FIG. 96. *Buplex suavis* (Loew) female, anterior aspect of head.

FIG. 97. *Stonemyia tranquilla* (Osten Sacken) female, lateral view of palpus.

FIG. 98. *Silvius sayi* n.sp. female, anterior aspect of head.

FIG. 99. *Buplex suavis* (Loew) female, lateral aspect of palpus.

FIG. 100. *Chrysops hungerfordi* n.sp. female wing picture.

FIGS. 101 to 104. Wing pictures of typical female *Silvius*.

PLATE XXXVI

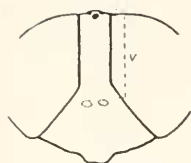
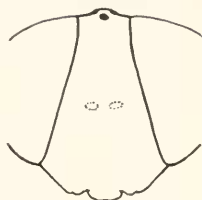
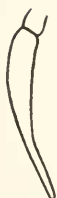
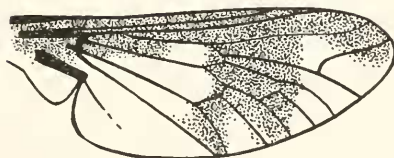
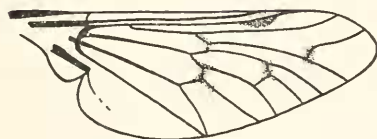
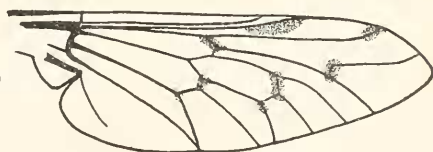
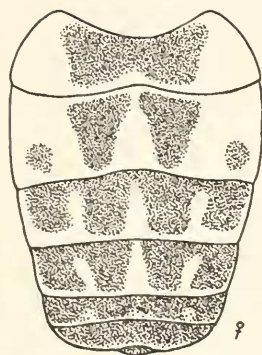
94 *S. TRANQUILLA*95 *S. LATICALLUS*96 *B. SUAVIS*98 *S. SAYI*97 *S. TRANQUILLA*99 *B. SUAVIS*100 *C. HUNGERFORDI*101 *S. LATICALLUS*102 *S. SAYI*103 *S. QUADRIVITTATUS*104 *S. POLLINOSUS*

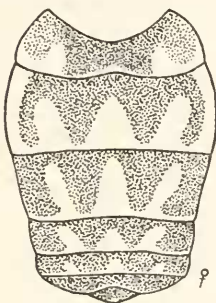
PLATE XXXVII

FIGS. 105 to 114. Dorsal abdominal patterns of new and related or misinterpreted Chrysops.

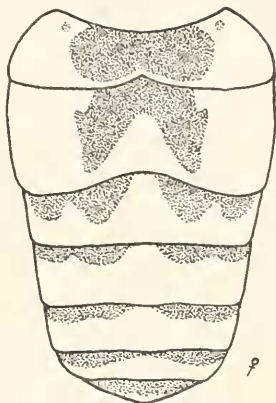
PLATE XXXVII



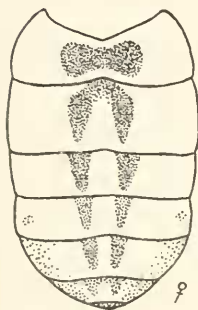
105 CLAVICORNIS ♀



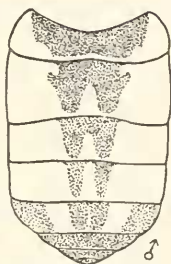
106 ROBUSTA ♀



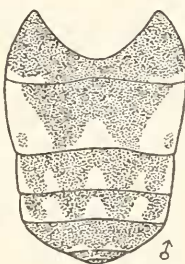
107 BISHOPPI ♀



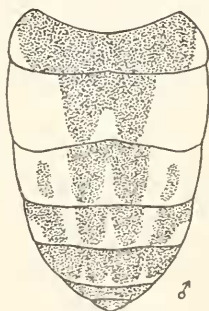
108 PACHYCERA ♀



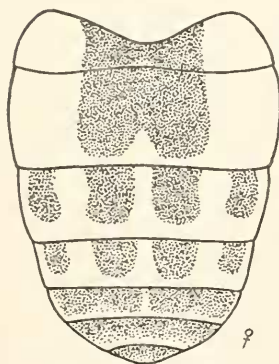
109 PACHYCERA ♂



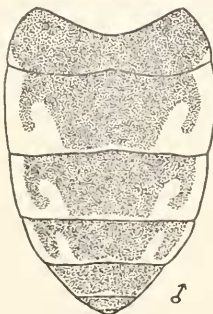
110 CLAVICORNIS ♂



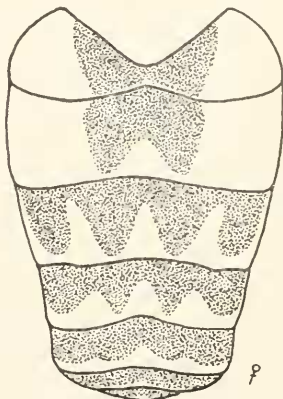
111 COQUILLETII ♂



112 COQUILLETII ♀



113 ROBUSTA ♂



114 FURCATA ♀